Founded in 1832

RAILWAY LOCOMOTIVES AND CARS

JULY 1957

A SIMMONS-BOARDMAN **TIME-SAVER** PUBLICATION

WH

FR-16

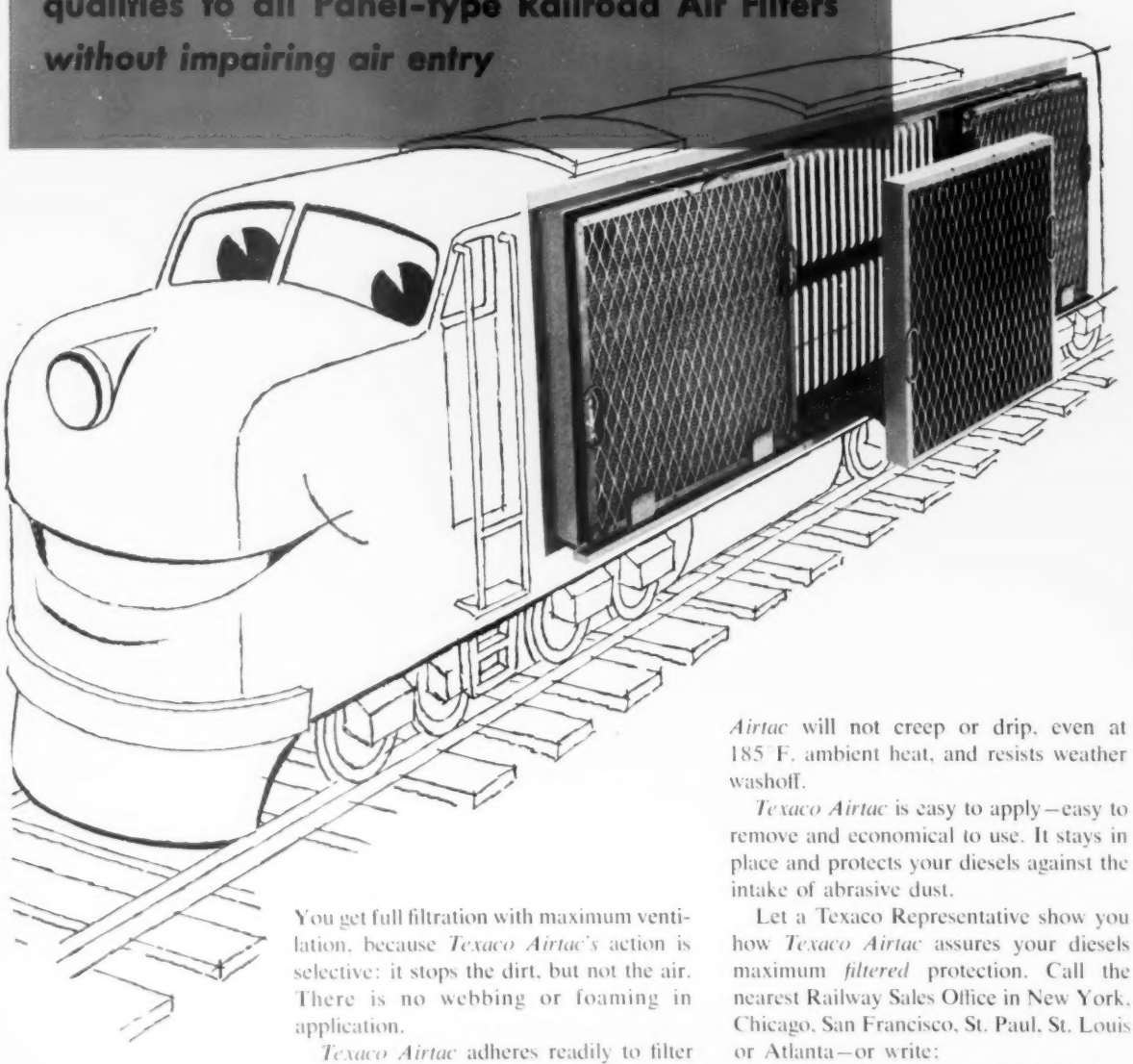
The high efficiency of the Miner FR-16 Rubber Draft Gear results from years of aggressive research procedure correlated with facts (not theories) learned from service and manufacturing experience.

We provide ample initial compression with 25% of the work accomplished at one-half travel so there will be no slack action, thereby preventing worn coupler carriers, draft keys, or vital car parts. The final pressures are low, ensuring the ultimate in lading protection.

W. H. MINER, INC. CHICAGO

AIRTAC STOPS THE DIRT BUT NOT THE AIR...

this gel-type oil imparts *super* dust-catching qualities to all Panel-type Railroad Air Filters *without impairing air entry*



You get full filtration with maximum ventilation, because *Texaco Airtac's* action is selective: it stops the dirt, but not the air. There is no webbing or foaming in application.

Texaco Airtac adheres readily to filter surfaces, keeping its ability to "wick and wet" through surface collections. Under the severest operating conditions, *Texaco Airtac* will not creep or drip, even at 185° F. ambient heat, and resists weather washoff.

Texaco Airtac is easy to apply—easy to remove and economical to use. It stays in place and protects your diesels against the intake of abrasive dust.

Let a Texaco Representative show you how *Texaco Airtac* assures your diesels maximum *filtered* protection. Call the nearest Railway Sales Office in New York, Chicago, San Francisco, St. Paul, St. Louis or Atlanta—or write:

The Texas Company, *Railway Sales Division*, 135 East 42nd Street, New York 17, New York.

TEXACO

TEXACO Railroad Lubricants

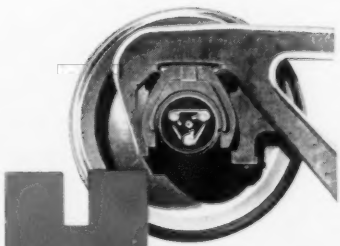
AND SYSTEMATIC ENGINEERING SERVICE

IN ALL 48 STATES

Why rail freight service is better than ever today

ONE REASON IS MECHANIZED TRACK MAINTENANCE. The picturesque "gandy-dancer" with his pick and shovel has given way to amazing machines that automatically jack up rails, replace ties, drive spikes, clean and tamp ballast. Today's better tracks help heavier trains carry more freight faster and smoother.

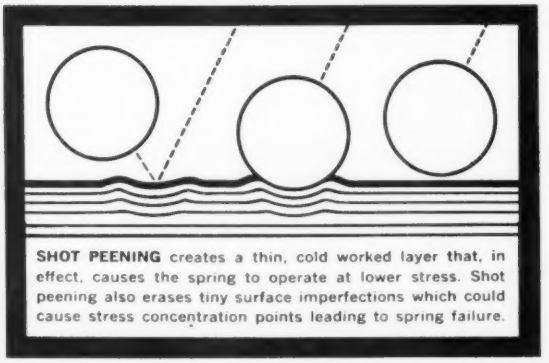
ONE MORE BIG REASON IS HYATT HY-ROLL BEARINGS for non-stop freight. HYATT Hy-Rolls eliminate delays for bearing inspection or lubrication because there's a 3-year lubricant supply sealed in. HYATTS have husky *straight cylindrical rollers* with extra load-carrying capacity for extra reliability, so freight cars can safely deliver the goods on speedier schedules, unhampered by costly hotboxes. That's why 27 leading lines have already adopted the HYATT Hy-Roll as a key part of their progressive modernization programs—to benefit all America with faster, more dependable freight service. Hyatt Bearings Division of General Motors, Harrison, New Jersey.



Another GM GENERAL MOTORS contribution to railroad prosperity

HYATT HY-ROLL BEARINGS
FOR NON-STOP FREIGHT

made stronger to last longer



SHOT PEENING creates a thin, cold worked layer that, in effect, causes the spring to operate at lower stress. Shot peening also erases tiny surface imperfections which could cause stress concentration points leading to spring failure.

Crucible *fatigue-resistant* springs

cut bad-order car expense

You can help keep cars off the repair tracks with Crucible's *fatigue-resistant* springs. They're single heat treated and shot peened – *made stronger to last longer* – yet they cost no more than conventional springs.

Because they last longer, Crucible *fatigue-resistant* springs reduce replacements due to spring failures–90% of which are caused by permanent set.

Fatigue-resistant springs can maintain their load-carrying capacities over longer periods because they have better hardenability, higher elastic limits and greater resistance to working stresses. Crucible ensures these qualities in every spring through strict manufacturing control from ore through final, rigorous compression tests.

Crucible single heat treated *fatigue-resistant* springs are your best guarantee of low-cost, long-lasting spring performance. For details, write for folder: *Spring Division, Crucible Steel Company of America, McCandless Avenue, Pittsburgh 1, Pa.*

CRUCIBLE spring division

Crucible Steel Company of America

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RAILWAY LOCOMOTIVES AND CARS

Founded in 1832 as the American Rail-Road Journal

JULY, 1957 VOLUME 131, No. 7

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NEXT MONTH:

Report on meetings AAR Mechanical Division and Electrical Section

Coated Abrasive Wheel

A new type coated abrasive wheel is doing a number of cleaning jobs at the St. Louis shop of the Missouri Pacific and has significantly reduced cylinder head cleaning time for the Frisco shop there.

This "PG" wheel is composed of hundreds of die-cut leaves of sandpaper formed into a wheel and locked into a metal hub. It is lightweight and easily used with flexible shaft machines and other portable equipment.

One of the advantages claimed for this wheel over other cleaning methods is that it cannot become filled or loaded. As the working surface of the wheel comes in contact with the work, the abrasive bond and backing are slowly worn away, so that there is always a fresh abrasive surface being presented to the work. This also accounts for a constant rate of cut, which results in a consistent finish and faster dirt, grease and carbon removal.

The Frisco shops are using "PG" wheels for removing carbon and grease deposits from diesel engine cylinder heads. After the heads are soaked in a solvent for about 5 min, the small coated abrasive wheel is used to clean and polish the tops. Countersunk areas not accessible with the wheel continue to be hand polished with abrasive cloth.

The total cleaning time with this method, including soaking, is about 12 min per head—half the time required by the previous method using wire brushes.

In addition to uniformity of finish and faster cleaning time, "PG" wheels are said to offer greater safety to the operators because the coated abrasive is securely locked in the hub mounting. Wheels used at the Frisco shops are made of aluminum oxide mineral, grit 50, on a cloth backing. The abrasive is held to the backing by a resin bond which is resistant to shock as well as high frictional heat.

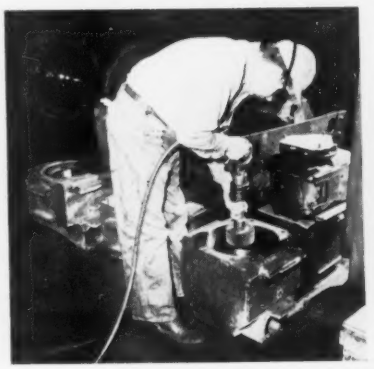
On the Missouri-Pacific, small "PG" wheels have replaced wire brushes and abrasive sleeves for operations such as removing carbon deposits from the crowns of pistons. Other jobs are cleaning the bores of cylinder liners, the outside surfaces of pistons, and removing dirt and grime from the inside of roller bearing housings.

It is reported that the finish produced by the "PG" wheel is smoother and more uniform than was obtained by other methods, and the wheels offer a safer and relatively clean operation. In addition, as compared with the previous use of abrasive sleeves, there is no downtime for a change of abrasive due to loading.

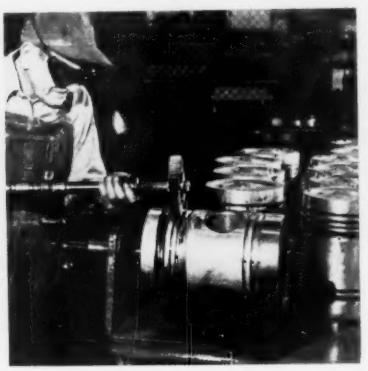
Other operations for which "PG" wheels are recommended include paint and rust removal from locomotive or car surfaces. Because of the wheel's claimed ability to produce a finish up to two grits finer than a comparable grit abrasive sleeve or belt, a single grit wheel can often be used for paint removal as well as surface preparation for repainting. In instances where the surface requires grinding, the small "PG" wheels may be employed following a disc operation. *Minnesota Mining & Manufacturing Co., Dept. RLC, 900 Bush st., St. Paul 6, Minn.*

EMD cylinder head is cleaned with 6-in. dia., $2\frac{1}{2}$-in. face wheel at the Frisco shop. Wheel has hundreds of leaves with aluminum oxide mineral, grit 50, on cloth backing.

Alco liners are polished at the MP shop with wheel mounted on a flexible shaft machine running at 3,400 rpm. Less pressure is required than is necessary with wire brush previously used.



Roller bearing housing has its bore polished with a grinder operating at 4,500 rpm. The grit 50 "PG" wheel, used by the MP, is said to produce finish comparable to grit 80 sleeve.



Wheel with 1-in. face and 6-in. dia. is used for cleaning the outsides of pistons at MP shop. Coated leaves are firm enough to remove material; flexible enough to follow contours.

Flexible Cushion Coupling

Paraflex, a new concept in flexible couplings for power transmission machinery, is available in capacities up to 600 hp at 900 rpm.

The coupling features a flexible tire, with synthetic tension members bonded together in rubber, clamped between two hubs which are mounted on the shafts to be coupled. Cap screws hold the tire in place between the flanges and clamp rings of the hubs. A transverse split molded into the tire permits easy installation and makes replacement possible without moving driver or driven machine. By loosening the cap screws, the tire can be easily removed and replaced.

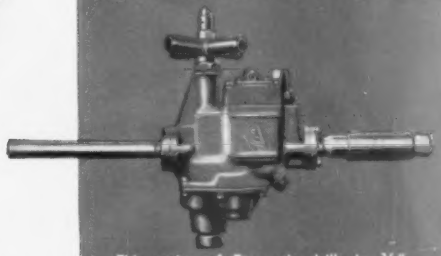
Both hubs of the coupling are machined to take Taper-Lock bushings.

(*Continued on page 8*)

Powerful Thor air drills

Backed by 64 years of railroad know-how

HUSKY POWER FOR BIG JOBS



This series of Thor air drills in ⅜", 9/16" and ⅞" sizes puts out the really big power needed for big jobs in car and locomotive repair shops. Non-reversible speeds 300-1400 r.p.m. Reversible—200-1000 r.p.m. Grip or side throttle styles.

COMPACT POWER FOR SMALL JOBS

Thor No. 2 series air drills are lightweight (slightly over 2 lbs.), compact and extremely powerful. 600 to 14,000 r.p.m. Capacity to 5/16" in steel (No. 3 Series to ⅜" in steel). Very handy for repair or installations in passenger cars. Lever, trigger or button throttles.

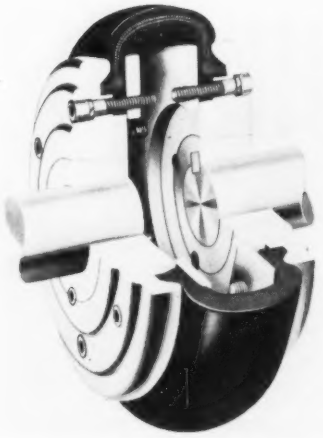
Thor air drills have been "high-balling" with every major American railroad. Next time you need air tools, be sure to ask your Thor factory representative for a demonstration. He's selling tools backed by over half a century of railroad know-how. Thor Power Tool Company, Prudential Plaza, Chicago 1, Illinois.

Thor
PORTABLE POWER
TOOLS

THOR POWER TOOL COMPANY • CHICAGO

Branches in all principal cities

EQUIPMENT . . . NEW IDEAS — NEW USES



(*Continued from page 6*)

These give the equivalent of a shrunk-on fit on shaft and permits quick and easy application to shafts of different diameters without reboring.

According to the manufacturer, Paraflex will take angular misalignment up to four degrees, parallel misalignment up to $\frac{1}{8}$ in., and end float up to $\frac{5}{16}$ in. based on size of coupling and duration of conditions, or will take all of these simultaneously. It absorbs torsional vibration developed by internal combustion engines at critical points in speed range and the resilience of the flexible tire cushions shocks to a remarkable degree.

No lubrication is required since there is no metal-to-metal contact. Safety is promoted by the flush design. All cap screws are countersunk, there are no protruding parts, and the metal surfaces are finished all over.

The coupling is designed to occupy a minimum space on the shaft. *Dodge Manufacturing Corporation, Dept. RLC, Mishawaka, Ind.*

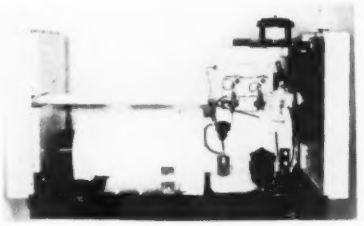
Aluminum Cleaner

Lumabrite, a solution of solvents, inhibited acid, and detergents for cleaning aluminum, is recommended for cleaning aluminum, aluminum window frames, stainless steel, or any enameled surfaces on railroad cars.

Cleaner is said to leave an invisible, inert coating, slowing up new oxidation. It gives off no toxic fumes, is nonflamable and in one operation cleans, degreases and brightens aluminum, indoors or outdoors. It is diluted with 5 to 10 parts of water, depending on its intended use, and is packed in a 6½-gal. non-returnable glass carboy. *Penetone Company, Dept. RLC, 74 Hudson ave., Tenafly, N. J.*

Diesel Engine

A two-cylinder, four-cycle engine has been added to the FM Model 45 diesel engine line, which also includes two one-cylinder sizes. According to the manufacturer, the engine features compactness and simplicity of design, rugged durability, attractive first cost and ability to handle widely varying loads over long periods of time with ample overload capacity.



The engine is rated at two speeds—18 hp at 1,200 rpm and 26 hp at 1,800 rpm.

The removable cylinder head contains the intake valve, exhaust valve, pintle nozzle and Lanova-type combustion chamber. The combustion chamber design improves combustion characteristics throughout the full range of loading.

The alloy cast-iron cylinder liners are wet type, easily replaceable. Pistons are aluminum alloy, each equipped with three compression rings and one oil control ring. A full floating piston pin riding in a bronze bushing connects the pistons to drop forged connecting rods. The counterbalanced crankshaft is forged steel, and is fitted with precision-type, steel backed, Tri-Metal lined bearings at main and crank journals.

The fuel injection system consists of an engine driven fuel transfer gear pump, primary and secondary filters, with a Bosch injection pump and pintle nozzle for each cylinder.

The lube oil system is the wet sump type with a gear pump for pressure lubrication of all crankshaft, camshaft and rocker arm bearings. Full flow oil filtration is available. Engine cooling system includes a conventional radiator with fan and centrifugal pump. A heat exchanger cooling system is available for stationary or marine applications.

A centrifugal governor controls engine speed to within 7% of throttle setting for the entire speed range of engine.

Engine length is 29 in. over fan and flywheel housing, 25 in. wide and 40 in. in height. Weight is 800 lb.

The FM model 45 diesel engine line now offers ratings of 5, 10, 18 and 26 hp for generator sets and power units for a wide range of railroad applications such as refrigerator cars, caboose car lighting and communication system relay stations. *Fairbanks, Morse & Co., Dept. RLC, Chicago 5.*

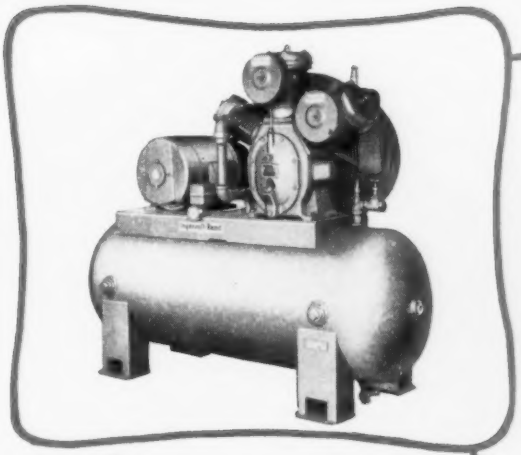
Gasket Cutter Set

This tool, for cutting round gaskets from asbestos, rubber, fibre or cork sheets, can be adapted to scribing or layout work as well. Basically a hexagonal-shaped bar with a six-sided face on which to mount the knife and point holders, the instrument provides an adjustable means to cut gaskets from 1¼ in. to 22¼ in. in diameter. Center point and knife holders can be placed on an extension bar to cut even larger radii. Designated Set B, this combination includes samples of four widely used sheet packings. *The Garlock Packing Company, Dept. RLC,409 Main st., Palmyra, N. Y.*

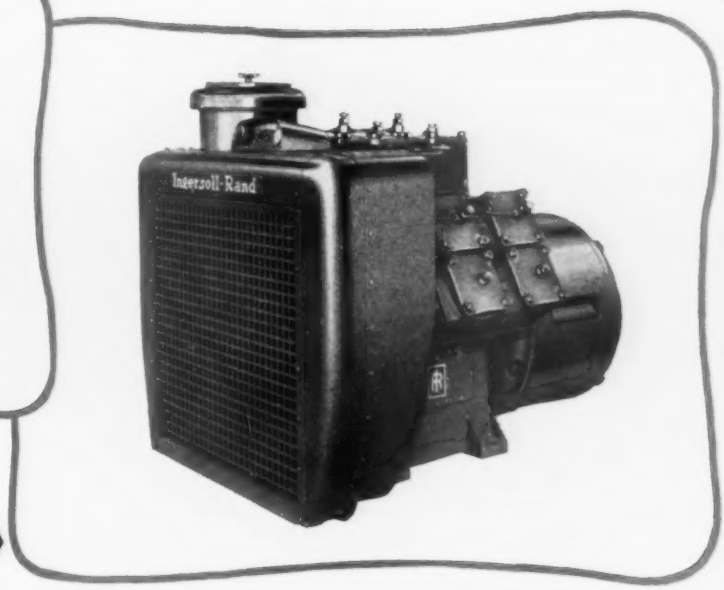
Internal Plating Tester

The Type MO Tukon Tester, is said to determine correctly the microhardness of the interior surfaces of chrome-plated metal castings. The unit is mechanically operated and load is applied under dashpot control, the speed of which may be

(*Continued on page 66*)



Type 30... A 15 horsepower unit mounted on receiver. Other units, ½ to 20 horsepower.



Type 40 ... This 125 horsepower Motor-compressor has built-in motor drive. Other sizes from 25 hp.

from ½ to 125 horsepower

AIR-COOLED COMPRESSORS

give you these important advantages

Wherever you need dependable, low-cost air power in the ½ to 125 horsepower range, Ingersoll-Rand air-cooled compressors offer attractive savings. Installation, operating and maintenance costs are low. These units are completely air-cooled—no water piping or jackets to clog, no water to freeze. Multi finned-tube intercoolers with forced-draft cooling keep compression efficiency high. Ask your Ingersoll-Rand representative for full information.

TYPE 30 — ½ to 20 horsepower ... These compressors with their outstanding 'Balanced-V Construction' have become first choice among all who look for top operating efficiency combined with low-cost maintenance. Each combination of cylinder sizes is designed to give the most compressed air at the desired pressure; single stage units for 40, 60 or 80 psi; two-stage units for 125, 200 or 250 psi. Type 30 compressors are available as tank mounted, baseplate mounted or bare compressor units. They offer unique money saving features not found in other units.

TYPE 40 — 25 to 125 horsepower ... These efficient two-stage, air-cooled units are available with three types of drive; built-in electric motor, flexible-coupled or V-belt. Dual control permits choice of constant speed or automatic start-stop control. Available for discharge pressures ranging from 80 to 200 psi. Channel Valves are efficient, quick-acting and air-cushioned for quiet operation and long service life.

Install Anywhere

- no danger of freezing
- no special foundation
- small floor space

Low-Cost Operation and Upkeep

- no cooling water required
- low maintenance
- regulation to meet requirements

Efficient Compression

- liberal valving
- large capacity intercooling
- high mechanical efficiency

Ingersoll-Rand

1-448 11 Broadway, New York 4, N. Y.

COMPRESSORS • CONDENSERS • AIR & ELECTRIC TOOLS • PUMPS • ROCK DRILLS • GAS & DIESEL ENGINES

NEWS . . . . . .

Jersey Central 1,600-hp Alco-GE road switcher lines up beside first railroad-owned diesel-electric as this pioneer Alco-GE switcher was prepared for retirement.

First U.S. RR Owned Diesel Will Be Preserved

More than 30 years of unheralded routine service for Jersey Central 1000 ended on June 13 when this 300-hp diesel-electric switcher was retired from service. It is now taking its place with other historic locomotives at the Baltimore & Ohio museum in Baltimore. It is the second diesel to be added to the locomotive collection. The first was the pioneer streamlined Electro-Motive passenger unit built in 1937 and owned by the B&O.

JC 1000 was manufactured jointly by American Locomotive (now Alco Products), General Electric, and Ingersoll Rand in 1925. It was the first commercially produced diesel-powered locomotive built for a U. S. railroad. It weighs 60 tons. It went into service on the Jersey Central's Bronx Terminal in New York City in October 1925 and was followed shortly thereafter by two duplicate units which were purchased by the B&O and the Lehigh Valley. Approximately 100 diesel electrics of this general type and developing either 300 or 600 hp were manufactured by the three companies between 1924 and 1936.

The 1000 and the others that followed were powered by the first American lightweight high-speed engines developed by Ingersoll Rand to meet general specifications drawn up by General Electric. These four-cycle, in-line engines develop 300 hp at 600 rpm and deliver 1 hp for every 60 lb locomotive weight. One of the unique features of the engine was airless injection of fuel. This was accomplished with two opposed spray nozzles in each combustion chamber through which oil is delivered under pressure by an injection pump driven from the main shaft. One injection pump serves all cylinders and a distributor controls the fuel distribution. The engine has six cylinders, with 10-in. bore and 12-in. stroke.

General Electric developed the electric traction equipment which included generators, motors and controls. This control system—in common with virtually every diesel-electric locomotive now in use—generally follows basic principles laid down in a patent secured by Herman Lemp of General Electric in 1914. This system eliminated manual control of the generator field.

The generator for the 1000 and its successors is a 600-volt dc compound-wound commutating pole type, separately excited and directly connected with the engine. A 60-volt exciter is mounted on the same shaft as the generator. A 32-volt storage battery for lighting and control current is charged by the exciter. The locomotive has four series wound motors, each rated at 95 hp.

The unit is 32 ft 6 in. inside knuckles. The frame, car body, and trucks were built at the Alco Schenectady, N.Y., plant. The engine and traction equipment were installed at GE's Erie, Pa., works. The locomotive was then moved to the Phillipsburg, N.J., plant of Ingersoll Rand, where it was tested and demonstrated for some time prior to its delivery to the Jersey Central.

SUMMARY OF MONTHLY HOT BOX REPORTS

	Foreign and system freight car mileage (thousands)	No. of cars set off between division terminals because of hot boxes			Miles car set off
		System	Foreign	Total	
March, 1953	2,904,228	2,692	6,077	8,769	331,192
March, 1954	2,658,757	2,196	3,637	5,833	455,813
1955					
March	2,830,398	2,717	5,076	7,793	363,197
April	2,787,705	3,471	6,485	9,956	280,002
May	2,931,850	4,860	8,664	13,524	216,788
June	2,945,955	6,080	10,226	16,306	180,666
July	2,906,558	8,086	13,635	21,721	133,813
August	2,954,439	8,555	14,358	22,913	128,941
September	2,923,592	5,896	10,469	16,365	178,649
October	3,025,177	3,966	7,182	11,148	271,364
November	2,950,228	2,010	3,972	5,982	493,184
December	2,922,034	1,819	3,774	5,593	522,444
1956					
January	2,925,109	2,029	4,302	6,331	462,029
February	2,794,161	2,570	5,611	8,181	341,542
March	3,027,684	2,517	6,212	8,729	346,853
April	2,930,389	3,202	6,881	10,083	290,626
May	3,063,427	4,672	10,903	15,575	196,688
June	2,973,732	6,777	15,125	21,902	135,774
July	2,788,347	8,484	16,067	24,551	113,573
August	3,039,173	9,891	16,892	26,783	113,474
September	2,918,875	6,834	12,629	19,463	149,970
October	3,113,460	4,357	8,429	12,786	243,505
November	2,953,625	2,650	5,560	8,210	359,759
December	2,933,940	2,256	4,436	6,692	438,425
1957					
January	2,767,060	3,373	6,121	9,494	291,453
February	2,675,265	3,272	6,844	10,113	264,538
March	3,027,280	3,164	6,687	9,851	307,306

Personal Mention

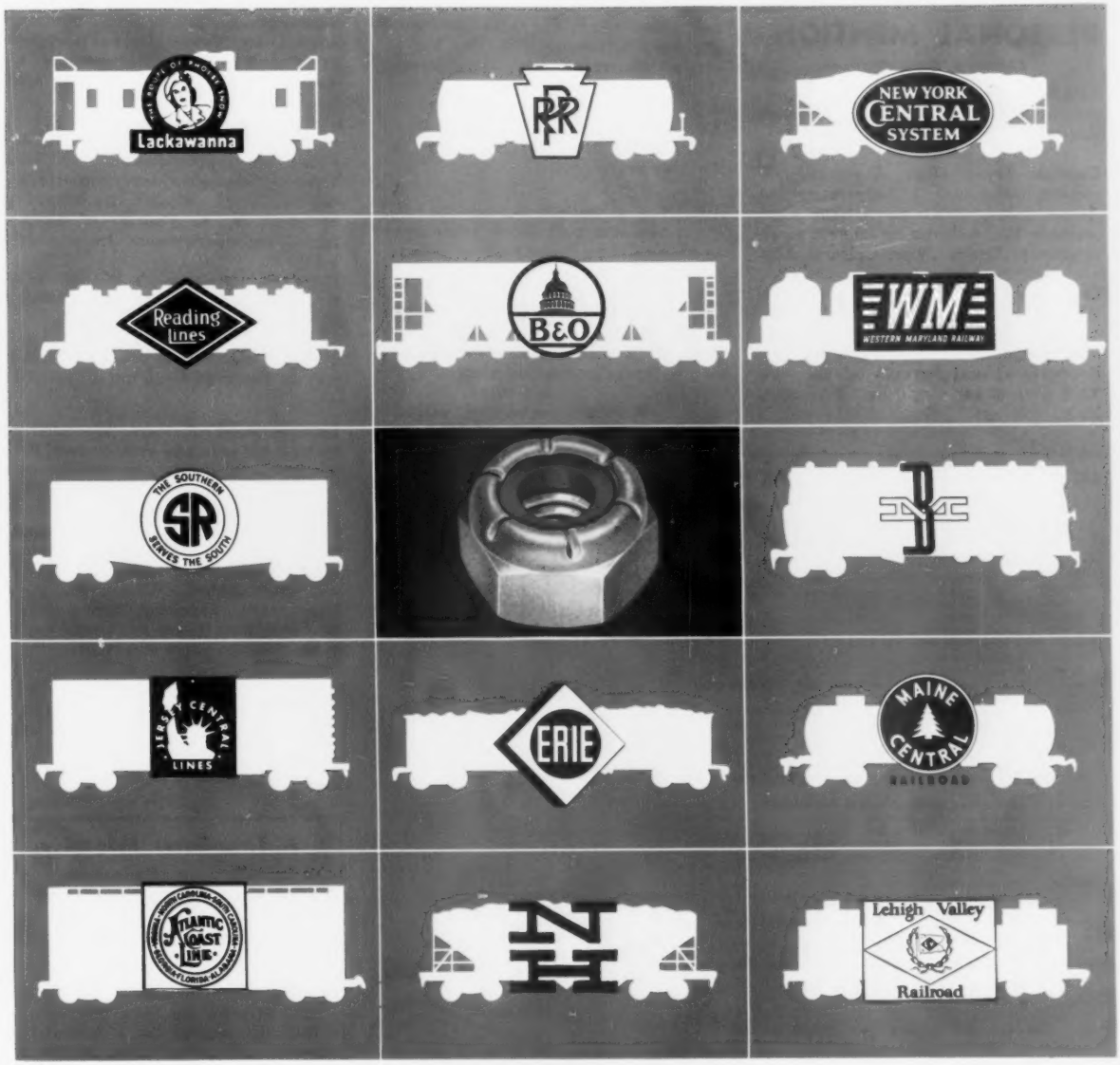
Atlantic Coast Line.—*H. G. Swanson*, enginehouse foreman at Wilmington, Del., appointed general foreman.

Boston & Maine.—*Daniel A. Benson*, general manager, operating—mechanical department, appointed acting vice-president and general manager—mechanical department, in place of *Frank W. Rourke* now on leave because of illness.

Erie.—*Carl E. Maahs* appointed master mechanic at Buffalo succeeding *Francis D. Kennedy*, retired.

New York Central.—*Beech Grove, Ind.*—*R. H. Miller* appointed methods and production engineer. *F. E. Britton* appointed assistant general foreman.

(*Continued on page 12*)



TEAMED UP TO WITHSTAND THE EFFECTS OF VIBRATION

These outstanding railroads and the builders of the cars they use are upgrading their requirements for vibration resistance and safety in freight cars. The stresses of today's high speed diesel operations demand it. Elastic Stop® nuts are being specified in many areas because they will not loosen under the vibrations set up in high speed operations. Association of American Railroads Rule 101 recognizes this with the following: *"Elastic Stop nuts applied are chargeable on the basis of Rule 105 when standard to car."* Thus, this rule calls for the replacement of Elastic Stop nuts with Elastic Stop nuts. This is important because Elastic Stop nuts reduce cost of maintenance and inspection to a minimum.

For details of the how . . . where . . . and *why* of Elastic Stop nut application to freight car vibration and maintenance reduction, write Dept. N35-723.

ELASTIC STOP NUT CORPORATION OF AMERICA

2330 Vauxhall Road, Union, New Jersey

PERSONAL MENTION

(Continued from page 10)

Canadian National.—A. R. RODDA appointed mechanical instructor, Western Region, at Winnipeg.

Canadian Pacific.—RAY AUBERTIN, appointed supervisor of apprentices at Angus Shops, Montreal. AUSTIN CASE succeeds Mr. Aubertin as apprentice instructor at Ogden shops, Calgary, Alta.

Chicago & North Western.—DONOVAN R. WHITENIGHT appointed general foreman of fabrication and car construction at new freight-car shop, Clinton, Iowa. Formerly general foreman of the New York Central car shops, East Rochester, N. Y.

Long Island.—R. P. TURNBULL, mechanical engineer, Richmond Hill, N. Y., appointed master mechanic, with jurisdiction over points other than Morris Park. JACK BRANNAN, assistant general mechanical superintendent, Richmond Hill, appointed superintendent of shops for Morris Park.

Louisville & Nashville.—*Louisville, Ky. Title changes*: S. C. SNOW from superintendent of motive power to superintendent, motive power maintenance; J. S. SWAN from supervisor of locomotive operation to superintendent, motive power operation; R. F. STUCKER from manager of scheduling to superintendent, motive power production control. J. M. VAWTER, F. J. FLASPOEHLER, JR., and H. E. REYNOLDS appointed assistant superintendents motive power production control. Mr. Vawter previously engineer of planning; messrs. Flaspoehler and Reynolds, foremen in diesel shop, South Louisville.

New York Central.—B. L. STROHL, assistant mechanical superintendent, New York, appointed mechanical superintendent, succeeding E. H. WRIGHT, transferred to Syracuse, N. Y. Position of assistant mechanical superintendent discontinued.

Norfolk & Western.—C. S. WILKERSON appointed assistant enginehouse foreman at Bluefield, W. Va., succeeding P. R. CALDWELL, retired. CARL F. SMITH, gang leader at Bluefield, succeeds Mr. Wilkerson as electrical inspector at Roanoke, Va.

Pennsylvania.—J. P. CARR, appointed engineer—methods and cost control, Pittsburgh. H. A. FETTIG, general foreman, locomotive shop, Wilmington, Del., succeeds Mr. Carr as enginehouse foreman, Conway, Pa. W. F. HARVEY, engineer methods and cost control, Pittsburgh Region, appointed supervisor methods and cost control, Wilmington. P. I. HARCLERODE appointed acting master mechanic, Fort Wayne and Grand Rapids district, Northwestern Region.

Richmond, Fredericksburg & Potomac.—WALTER F. GALLAHAN appointed assistant foreman of car inspectors at Potomac Yard.

(Turn to page 18)

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of March		3 months ended with March	
		1957	1956	1957	1956
3	Road locomotive miles (000) (M-211):				
3—05	Total, steam	2,393	4,197	7,126	12,909
3—06	Total, Diesel-electric	38,094	38,383	109,265	111,042
3—07	Total, electric	744	724	2,138	2,164
3—04	Total, locomotive-miles	41,481	43,527	119,269	126,780
4	Car-miles (000,000) (M-211):				
4—03	Loaded, total	1,723	1,754	4,798	5,038
4—06	Empty, total	984	947	2,790	2,778
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6—01	Total in coal-burning steam locomotive trains	6,881	10,428	19,607	31,324
6—02	Total in oil-burning steam locomotive trains	221	957	584	3,329
6—03	Total in Diesel-electric locomotive trains	114,301	109,901	318,505	315,934
6—04	Total in electric locomotive trains	2,365	2,152	6,543	6,465
6—06	Total in all trains	124,653	124,237	347,917	359,376
10	Averages per train-mile (excluding light trains) (M-211):				
10—01	Locomotive-miles (principal and helper)	1.02	1.03	1.02	1.03
10—02	Loaded freight car-miles	44.4	43.3	42.9	42.7
10—03	Empty freight car-miles	25.3	23.4	25.0	23.5
10—05	Total freight car-miles (excluding caboose)	69.7	66.7	67.9	66.2
10—05	Gross ton-miles (excluding locomotive and tender)	3,208	3,067	3,114	3,046
10—06	Net ton-miles	1,466	1,402	1,414	1,391
12	Net ton-miles per loaded car-mile (M-211)	33.1	32.4	32.9	32.6
13	Car-mile ratios (M-211):				
13—03	Per cent loaded of total freight car-miles	63.6	64.9	63.2	64.5
14	Averages per train hour (M-211):				
14—01	Train miles	19.1	18.7	18.9	18.7
14—02	Gross ton-miles (excluding locomotive and tender)	60,645	56,863	58,237	56,370
17	Car-miles per freight car day (M-240):				
17—01	Serviceable	47.1	47.3	45.6	46.7
17—02	All	45.3	45.5	43.9	44.9
18	Average net ton-miles per freight car-day (M-240)	954	956	914	942
20	Per cent of home cars of total freight cars on the line (M-240)	43.2	41.5	43.5	41.8

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3—05	Steam	308	814	1,025	2,620
3—06	Diesel-electric	19,839	20,829	58,151	60,943
3—07	Electric	1,225	1,334	3,593	3,879
3—04	Total	21,371	22,977	62,769	67,442
4	Passenger-train car-miles (000):				
4—08	Total in all locomotive-propelled trains	219,087	237,022	639,605	691,079
4—09	Total in coal-burning steam locomotive trains	2,308	4,935	7,712	15,642
4—10	Total in oil-burning steam locomotive trains	47	1,665	240	6,010
4—11	Total in Diesel-electric locomotive trains	201,750	214,350	588,099	623,229
12	Total car-miles per train-mile	9.74	9.89	9.70	9.83

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours:				
1—01	Steam, coal-burning	162,595	251,120	499,352	753,925
1—02	Steam, oil-burning	5,495	26,983	18,745	81,633
1—03	Diesel-electric[1]	3,890,502	3,967,479	11,367,344	11,593,865
1—06	Total	4,061,266	4,248,876	11,894,250	12,438,724
2	Passenger yard switching hours:				
2—01	Steam, coal-burning	3,965	6,958	12,811	21,143
2—02	Steam, oil-burning	115	3,106	919	8,731
2—03	Diesel-electric[1]	248,751	253,540	733,996	744,452
2—06	Total	277,755	290,244	820,929	852,462
3	Hours per yard locomotive-day:				
3—01	Steam	5.5	5.8	5.7	5.9
3—02	Diesel-electric	15.4	16.2	15.6	16.1
3—05	Serviceable	15.6	16.1	15.7	16.0
3—06	All locomotives (serviceable, unserviceable and stored)	14.3	14.5	14.5	14.4
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.62	1.68	1.71	1.71
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	.78	.75	.79	.76

[1] Excludes B and trailing A units

A Time-Saver Magazine

With this issue Railway Locomotives and Cars joins all other Simmons-Boardman publications in adopting a new slogan which, as now appears on the front cover, is to read "A Simmons-Boardman Time Saver Magazine." It will tend to point out, in a new way, that the articles in a technical book, such as this, have, as their primary reason for being published, the end task of bringing to readers the kind of information that will mean a real economy of time and dollars on the job. One of the disturbing things about the writing of technical articles is the fact that it sometimes takes volumes of data and notes to make a few terse paragraphs in final article form. This type of condensation is the "meat" that is behind the TIME SAVER idea. It is our job, as editors, to collect the up-to-the-minute ideas from the four corners of the country and put them in such form that they will save others TIME — and dollars of maintenance expense—in all sections of the country. Saving the reader time on his job has always been our objective. The new slogan is our guarantee that the articles of the future will be designed, in the best of modern tradition, to effect even greater time saving for our railroad readers.

HAULING A LOAD...REPAIRING THE ROAD

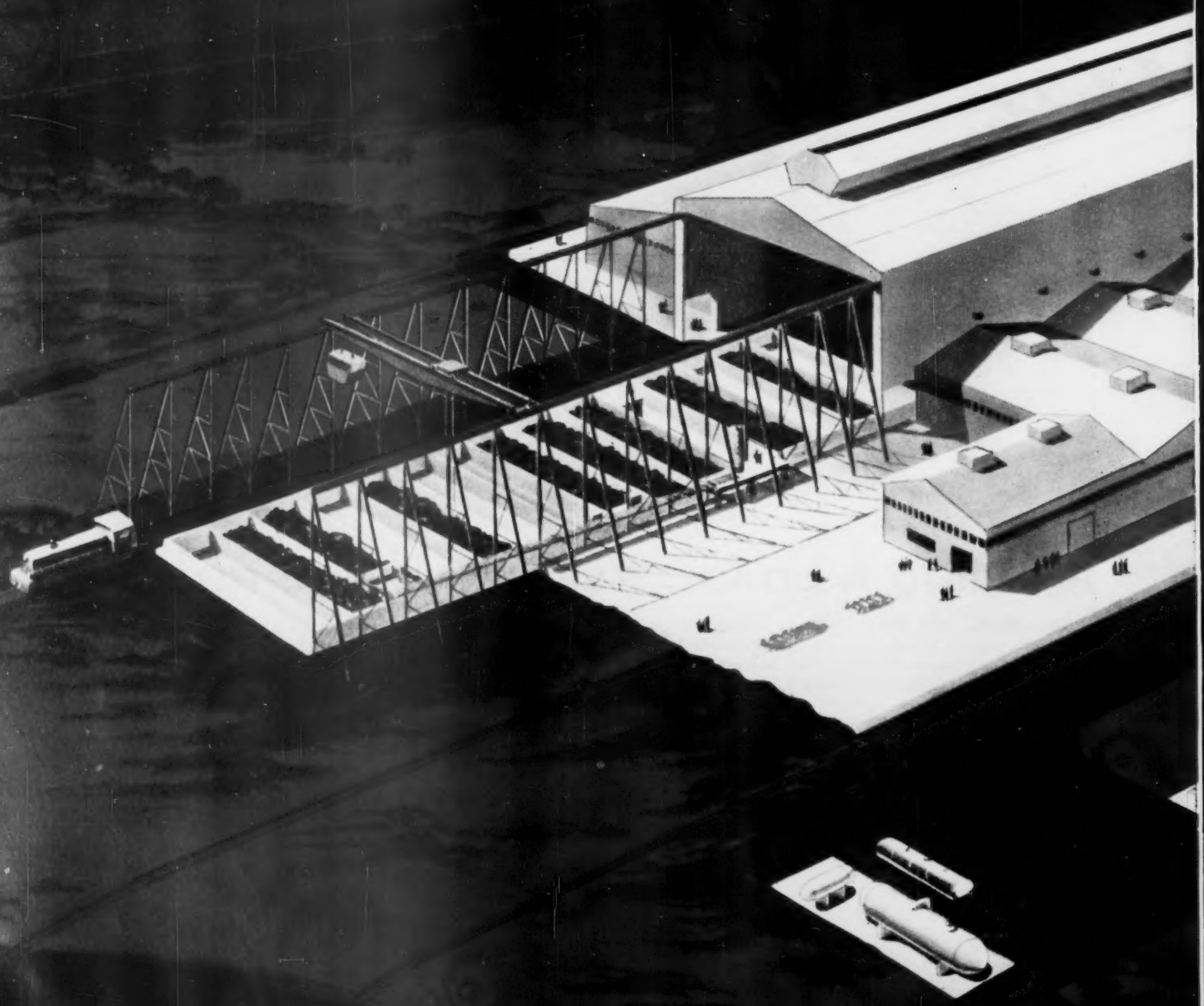
ESSO DIOL RD 77—Specifically developed for the heavy-duty engines of modern locomotives, Esso Diol RD 77 assures peak efficiency and long, trouble-free engine performance—high standards that mean extra lubrication economy.

ESSOLUBE HD—For smaller, high-speed diesel engines in maintenance-of-way equipment, Essolube HD detergent-type motor oil provides dependable engine protection . . . cuts oil consumption with long-lasting lubrication.

Skilled Esso technicians are ready to analyze your petroleum needs and recommend the best fuel or lubricant for your diesel equipment. For information or technical assistance, call your local Esso office, or write: Esso Standard Oil Company, Railroad Division, 15 W. 51st Street, New York 19, N. Y.

ESSO RAILROAD PRODUCTS

The Plant that ACCEPTANCE built!



GRIFFIN WHEEL PLANT • COLTON, CALIFORNIA

Complete plant and office facilities to meet the needs of West Coast railroad shops.

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The proof of a new product is in its *acceptance*—and to date the new Griffin EQS steel wheel is rolling under the freight cars of 62 railroads and private car lines in the United States and Canada.

Griffin's answer to this ready acceptance by the railroads of the new EQS wheel is the construction of this newest and most modern steel wheel plant at Colton, California, scheduled for completion early in 1957.

NOW IN PRODUCTION

Longer wheel life—better wear—greater uniformity and closer tolerances. Find out how these advantages of the new Griffin EQS give you a higher return on your wheel investment.

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Give the "green" to **GRIFFIN** *and watch your costs go down!*

SURER, SAFER, SIMPLER CONTROL

give

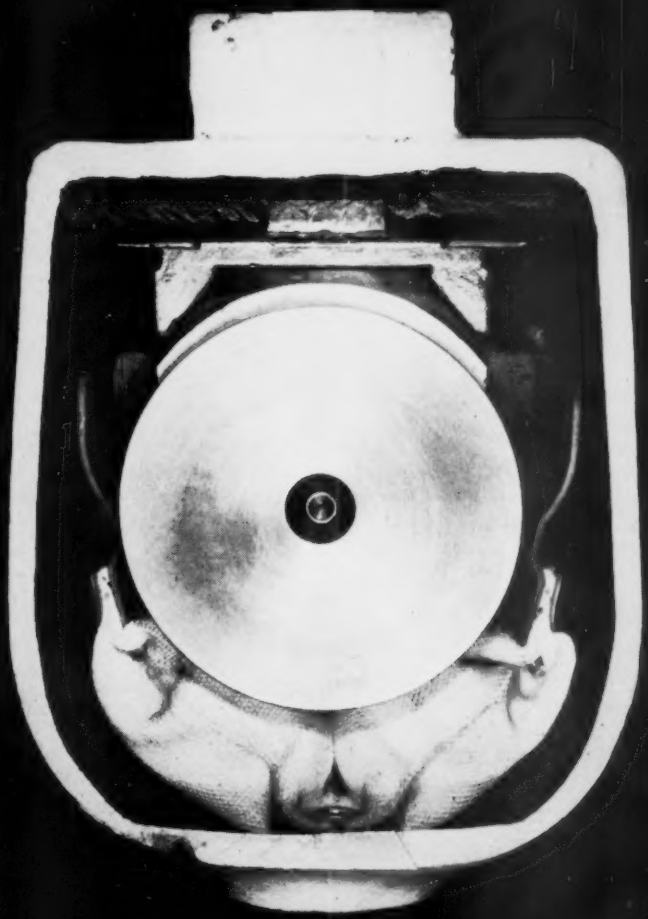
Positive Shift Prevention! Built-in fiber retainers prevent both endwise shift and shift from journal rotation. Pad resilience holds retainers against side of box, away from journal. One universal style for use in boxes with or without retaining ribs.

Far Better Wicking Action! New heavier cotton weave provides superior wicking action. Cover is woven as a single tube, eliminating all possible seams from the wicking path. The twin design also provides for equalization of the oil level in the journal box through a channel at the center.

Improved Resilience! Twin inserts are made of specially molded foam neoprene, compounded to our specifications. This provides excellent set resistance and oil absorption properties, and is designed for improved resilience.

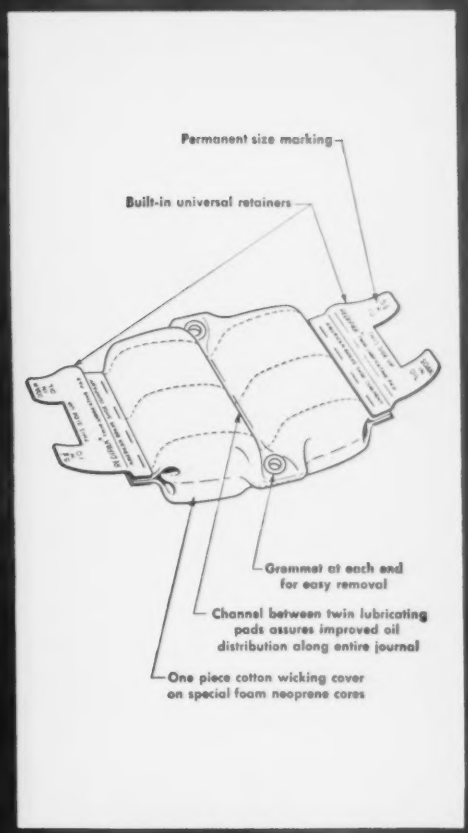
Superior Oil Distribution! New twin design assures improved oil distribution along the entire length of the journal.

OF THE HOT BOX PROBLEM!



For boxes with or without retaining ribs, fiber plates integral with the new Redipak twin pads engage the stop columns, preventing both endwise and rotational shifting.

COMPARE THESE FEATURES OF REDIPAK TWIN PADS


Permanent size marking
Built-in universal retainers
Grommet at each end for easy removal
Channel between twin lubricating pads assures improved oil distribution along entire journal
One piece cotton wicking cover on special foam neoprene cores

Here it is . . . the new, improved Redipak twin lubricating pad! This latest triumph of American Brake Shoe's bearing research retains the simplicity, economy, and durability of the original model—yet achieves new standards of dependable, all-year-round lubrication!

This new Redipak twin lubricating pad is even easier to install, too. Sturdy fiber retainers keep it securely in position . . . whether or not the box is equipped with retaining ribs.

Try out this new Redipak twin lubricating pad and see for yourself how it improves lubrication!

AMERICAN Brake Shoe COMPANY

RAILROAD PRODUCTS DIVISION

530 Fifth Avenue • New York 36, N.Y.

A-4542

Supply Trade Notes

AMERICAN BRAKE SHOE COMPANY.—*Thomas W. Russell, Jr.*, general purchasing agent, has been elected vice-president.

■

YOUNGSTOWN STEEL DOOR COMPANY.—*Emmett P. Dowling* has been elected president and chief executive officer, succeeding *John P. McWilliams*, who has been reelected chairman.

■

GENERAL MOTORS DIESEL LIMITED.—A new single-story, concrete and asbestos building, 120 ft long and 50 ft wide, has recently been placed in service at London, Ont., for the testing of GM locomotives and mobile power cars. Four road locomotives can be housed at one time. Three work levels permit inspection of all parts of a locomotive.

■

AIR REDUCTION COMPANY.—Plans are under way at Lorain, Ohio, for a $3,000,000 expansion that will more than double production facilities for gaseous and liquid oxygen. Construction is expected to take about one year.

■

WAUKESHA MOTOR COMPANY.—*Newton H. Willis*, manager of the Railway Division, has been named a vice-president of the company.

Mr. Willis received a Bachelor of Science Degree in mathematics and physics from Carroll College in 1928 and a similar degree in mechanical engineering in 1930 from the University of Wisconsin College of Engineering. He started his career with Waukesha in 1930 as a design and engineering draftsman. In 1933 he began work with the newly formed Railway Division, then known as the Refrigeration Division, progressing to the position of general manager. Mr. Willis is a licensed professional engineer.

■

FAIRBANKS, MORSE & CO.—*V. H. Peterson*, vice-president, engineering, has been appointed vice-president, sales, succeeding *Robert H. Morse, III*, who has become vice-president, budgets and planning. *John C. Elmburg* has been appointed general sales manager.

■

CONTINENTAL BEARING RESEARCH CORPORATION.—The *Continental Bearing Research Corporation*, 489 Fifth ave., New York, has been formed to analyze, design and supply bearings, in production or semi-production quantities, for specific uses, as well as for use in water pumps, gas turbines, etc., which operate with low-viscosity lubricants, such as air and water. Design studies are also undertaken on a project or consulting basis. *Stanley Abramovitz*, formerly with the Franklin Institute, directs engineering activities.

■

COOPER-BESSEMER CORPORATION.—*Ralph L. Boyer* has been elected vice-president and director of engineering, succeeding *Hewitt A. Gehres*, retired.

E. P. Dowling

Harrison Taylor

T. W. Krueger

C & D BATTERIES, INC.—*Wallace M. Schleicher*, formerly general sales manager for Edison Storage Batteries, has been appointed manager, motive power and railroad sales, for C & D at Conshohocken, Pa. *Harrison Taylor*, formerly staff engineer in the general offices service division of the Electric Storage Battery Company, has joined the Headquarters Service Division of the engineering department of C & D.

■

ARMCO STEEL CORPORATION.—*Harry L. Gaddis* has been appointed superintendent of the railroad wheel works department of the Butler, Pa., works.

DUFF-NORTON COMPANY.—*T. W. Krueger*, sales manager, Jack Division, has been appointed sales manager, in charge of all sales for the Jack and Coffing Hoist Divisions.

■

UNION CARBIDE CORPORATION, LINDE COMPANY.—*William M. Haile* has been appointed president of Linde. Mr. Haile was previously a vice president.

UNION CARBIDE DEVELOPMENT COMPANY.—*R. E. Cornwell*, vice-president, has been appointed president.

Obituary

LEON A. DOUGHTY, president of C & D Batteries, Inc., died suddenly on May 18.

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE JUNE ISSUE

FREIGHT CARS

Road and builder	*No. of Cars*	*Type of car*	*Cap., tons*	*Other detail*
ALASKA:				
General American	50	Tripple hopper	70	Cost, $486,824; delivery to begin second quarter 1958.
ATLANTIC COAST LINE:				
Company shops	9	Flat	125	Approximate unit cost, $30,000. Two delivered; others to be completed in September or October.
DELAWARE & HUDSON:				
Bethlehem Steel	1,000	Hopper	70	200 to be delivered in each of next five years.
FLORIDA EAST COAST:				
Thrall Car	6	Flat	50	Unit cost, approximately $8,100. For August delivery.
GRAND TRUNK WESTERN:				
Pullman-Standard	300	Box	—	For fourth quarter 1957 delivery.
ACF Industries	100	Triple hopper	70	For fourth quarter 1957 delivery.
Magor Car	100	Flat	—	For first quarter 1958 delivery.
International Ry. Car	15	Cabooses	—	Unit cost, $14,687. Delivery expected fourth quarter 1957.
NORFOLK & WESTERN:				
International Railway Car	15	Cabooses	—	For first quarter 1958 delivery.
SACRAMENTO NORTHERN:				
ACF Industries	20	Drop bottom gondola	70	For first quarter 1958 delivery.
TIDEWATER SOUTHERN:				
Pacific Car & Foundry	10	DF box	—	50-ft. insulated; equipped with roller bearings. For fourth quarter 1957 delivery.
ACF Industries	5	Drop-bottom gondola	70	For first quarter 1958 delivery.
UNION PACIFIC:				
General American	50	Tank	—	
UNION TANK CAR:				
Company shops	10	Tank	—	8,000-gal.
	13	Tank	—	10,000-gal. 23 cars for delivery late 1957 and first quarter 1958.
WESTERN PACIFIC:				
Pacific Car & Foundry	100	DF box	—	Insulated and equipped with roller bearings.
ACF Industries	75	Drop-bottom gondolas	70	

PASSENGER-CAR ORDERS

Road and builder	*No. of Cars*	*Type of car*	*Other detail*
CANADIAN NATIONAL:			
Budd Co.	1	RDC-1	Estimated cost of three cars, $540,000.
	2	RDC-3	

INQUIRIES AND NOTES

FREIGHT CARS:

Great Northern.—Directors have approved plans to build 1,000 steel box cars and 50 50-ton flat cars and to install steel sides on 500 wood-sheathed box cars in 1958. Cost, $10,000,000.

SPECIAL:

Canadian National.—Ordered 49 steam generator cars, Canadian Car Company. Cars, to be delivered late in 1957, will be equipped with two steam generating units, a diesel-generator set, water tanks with total capacity of 3,000 gal. and 500-gal fuel tanks.

new

luggage rack with illuminated seat numbers

Now, with illuminated seat numbers located at the end of the brackets and directly over each seat, new convenience is added to the tested and proved features of Adlake Luggage Racks. A glance tells the passenger "This is your seat!"

Safe and sturdy, built to take abuse and loads. Sweeping in line, to harmonize with modern railroad car design, and finished for attractive appearance. No wonder Adlake Luggage Racks are the choice of railroads all over America!

For information or assistance in luggage racks, and facts about Adlake hardware for your cars, write us at 1152 N. Michigan, Elkhart, Indiana.

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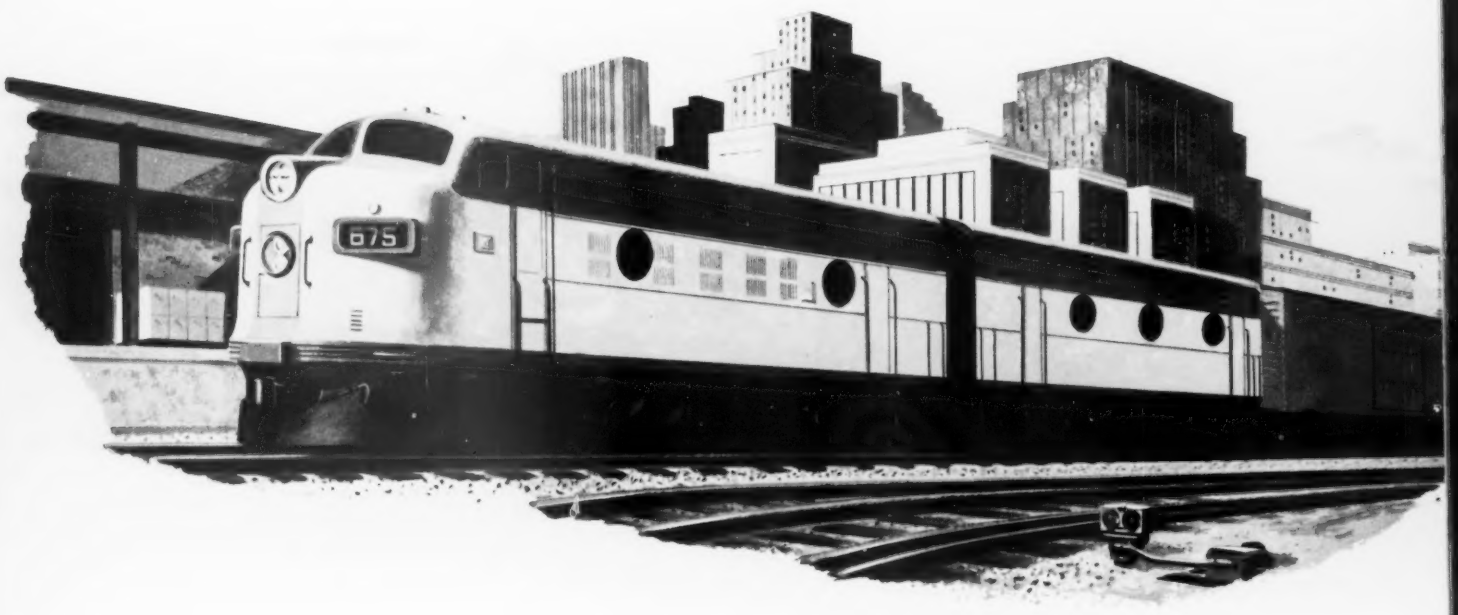
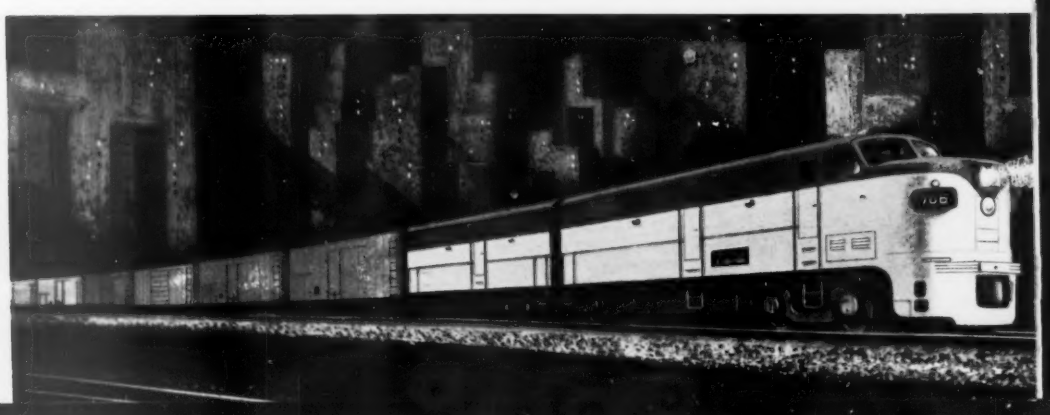
Manufacturers of ADLAKE Specialties and Equipment for the Railroad Industry.

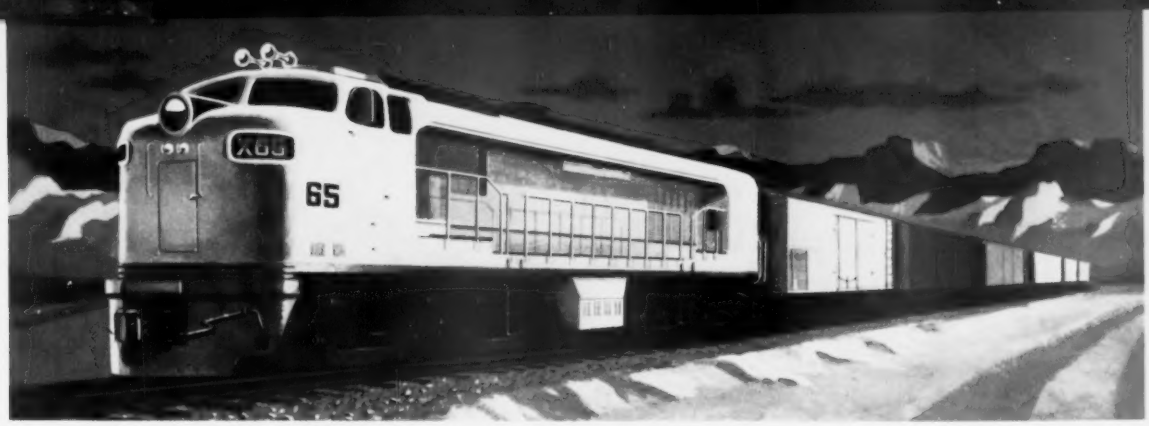
There's Improved Railroading with National Specialties

EXAMPLE:

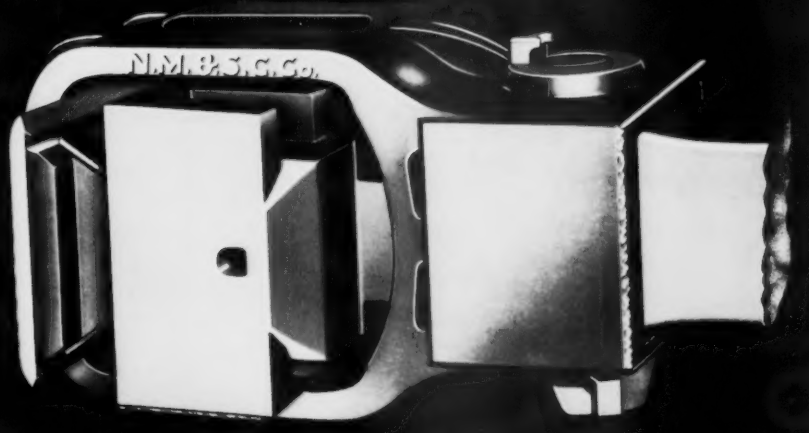
National Rubber-Cushioned







Draft Gears for Road Locomotives



DRAFT GEARS

COUPLERS

YOKES

FREIGHT TRUCKS

JOURNAL BOXES

Over 9 out of 10 diesel and gas turbine road locomotives are equipped with National Rubber-Cushioned Draft Gears. That's because National Rubber-Cushioned Draft Gears, with exclusive shear-compression principle, give *continuing* performance so that equipment availability goes up.

When you think of rubber-cushioned draft gears, remember this important fact: Since 1937, over 40,000 National Rubber-Cushioned Draft Gears have given over *200 billion* miles of satisfactory service. *No other manufacturer can match National's record.*

AA-4693

NATIONAL MALLEABLE and STEEL **CASTINGS COMPANY**

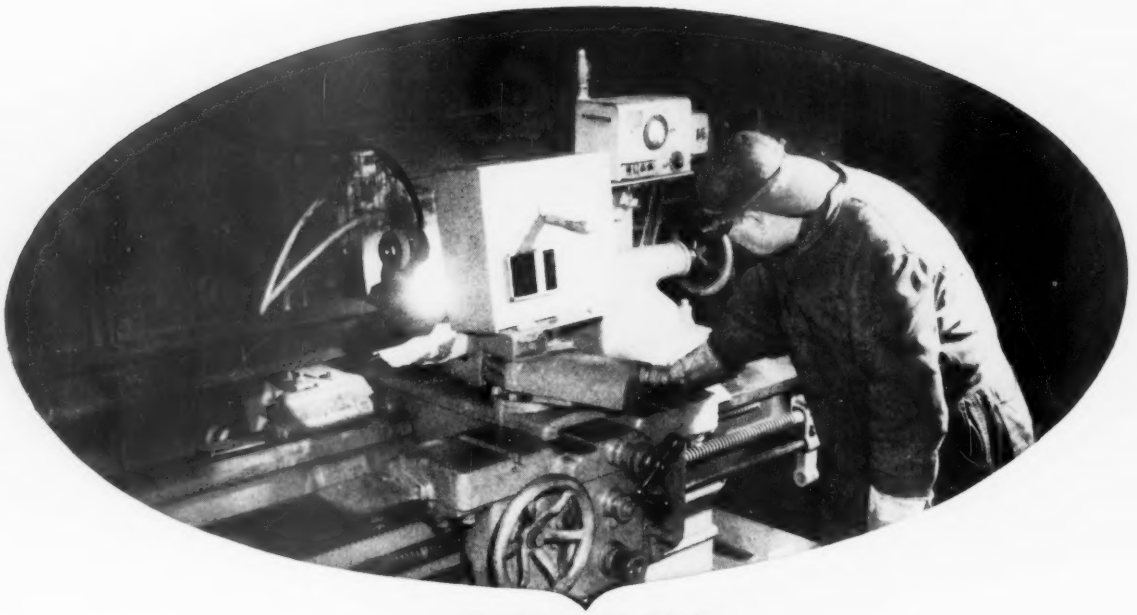
RAILWAY DIVISION HEADQUARTERS
CLEVELAND 6, OHIO

INTERNATIONAL DIVISION HEADQUARTERS
CLEVELAND 6, OHIO

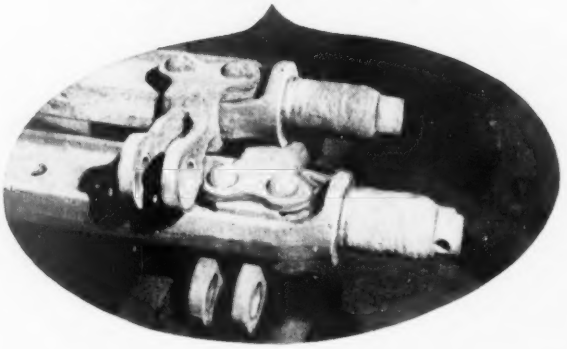
CANADIAN SUBSIDIARY: NATIONAL MALLEABLE & STEEL CASTINGS COMPANY OF CANADA, LTD. • TORONTO 1, ONTARIO

ESTABLISHED IN 1868

GEARED TO PROGRESS
P R I
MEMBER



REBUILD WITH SIGMA ... AND SAVE!



The New York Central System saves more than $5,000 a year by using Sigma welding to rebuild passenger car brake beams. Previously, it took 30 minutes to rebuild trunnions on a single brake beam by manual arc welding. Now, the same operation is completed in only 6 minutes — thanks to the speed and efficiency of automatic Sigma welding. This greater speed provides savings of more than one dollar for every brake beam rebuilt.

Sigma welding's combination of automatic wire feed and argon gas shielding is simplifying and speeding a wide range of jobs in shops across the nation. Both manual and automatic mechanized installations are easy to operate and maintain.

Sigma welding is only one of many modern methods developed by LINDE to help railroads save time and money. For more detailed information, call your local LINDE representative or write for free booklet F-7942. Do it today!

The familiar symbol of over forty years' service to the railroad industry.

OXWELD TRADE MARK

RAILROAD DEPARTMENT

LINDE COMPANY

DIVISION OF **UNION CARBIDE** CORPORATION

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adds 10 more 1200 and 1600 hp.

Fairbanks-Morse locomotives

...DEPENDABLE POWER FOR MODERN RAILROADING

Fairbanks, Morse & Co.,
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FAIRBANKS-MORSE

a name worth remembering when you want the BEST

DIESEL LOCOMOTIVES AND ENGINES • MOTOR CARS AND RAILROAD EQUIPMENT • ELECTRIC MOTORS • GENERATORS • PUMPS • SCALES • WATER SERVICE EQUIPMENT • HAND LAMPS

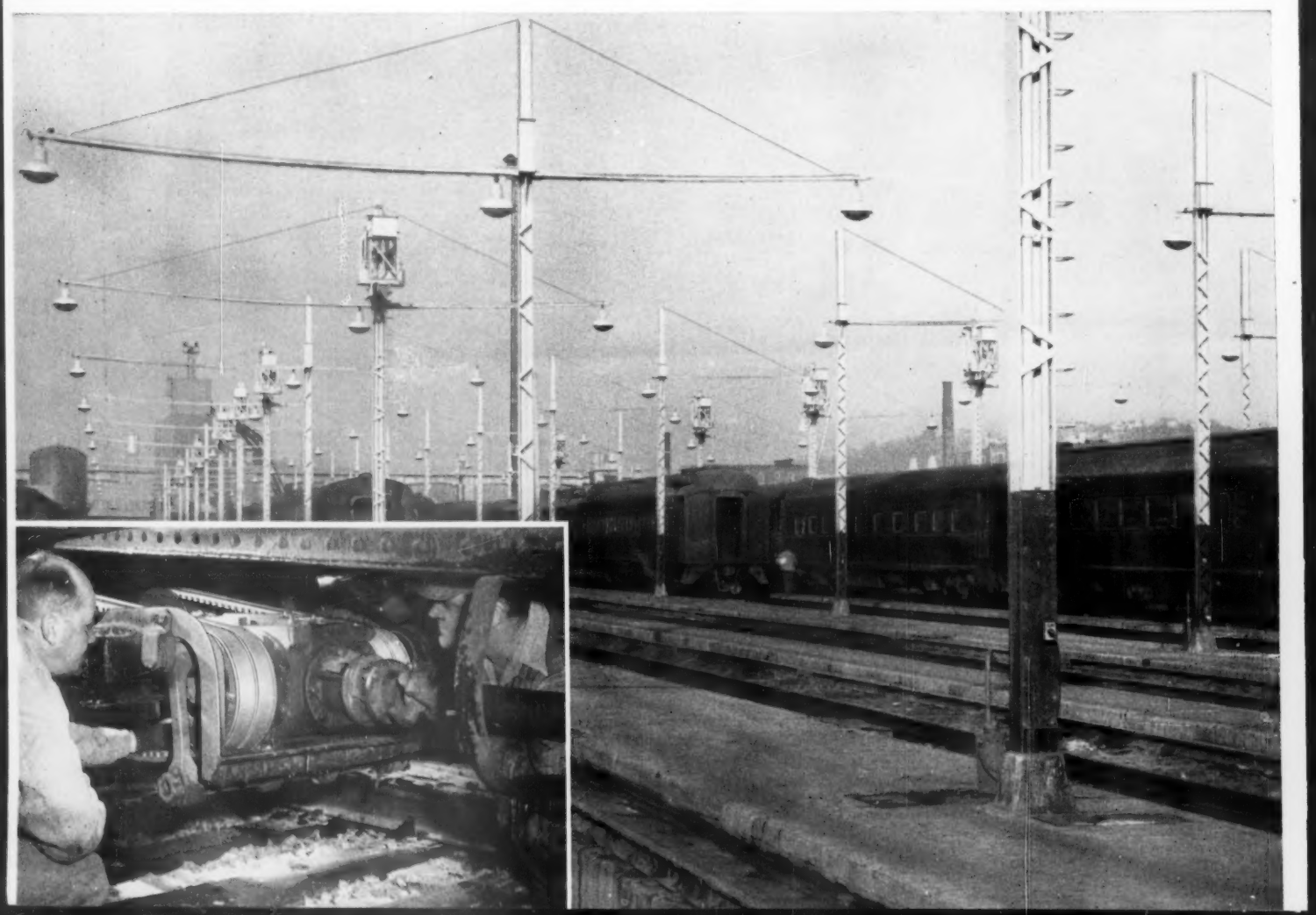
You Need Low Cost, Dependable Electric Power

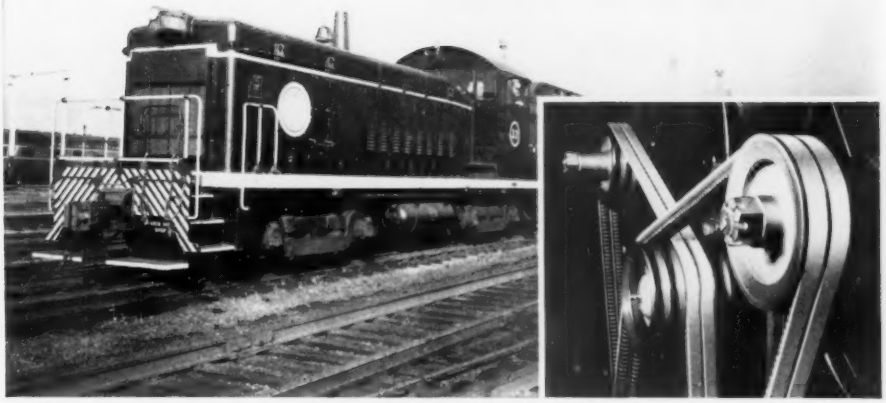
. . . And Get It—Efficiently, Economically— With Dayton V-Belt Generator Drives

For complete passenger car electric service, for diesel engines, for train communications systems, today's most dependable, most easily maintained source of power is the Dayton Railway V-Belt Drive. In all weather and all climates, under all road conditions, on sharpest curves and on the straightaways, Dayton Railway Connector Belts and Endless Cog-Belts* perform outstandingly!

Crews can quickly, easily check an undercar Dayton V-Belt Drive — making sure of uninterrupted lighting, heating, air conditioning. Dayton V-Belts can be changed on the tracks without costly dismantling of equipment. (Inset: Dayton Field Engineer also inspects undercar drive as part of regular preventive maintenance service.)

To help you reduce costs further while improving V-Belt life and efficiency, Dayton Field Engineers are always available in any part of the country to serve you with the best in technical knowledge and V-Belt equipment. Write Dayton Rubber Company, Railway Division, Dayton 1, Ohio, for complete information or to contact a Dayton Field Engineer.





When your Dayton Field Engineer specifies Dayton V-Belts, he assures you the best possible V-drive operation. Dayton V-Belts are on more cars than all other makes of V-Belts and are specified as original equipment on 90% of all new Diesel locomotives.

Dayton Rubber

World's Largest Manufacturer of V-Belts

Specialized Railway Representatives in Atlanta, Chicago, Cleveland, Dallas, Dayton, Moline, New York, San Francisco and St. Louis

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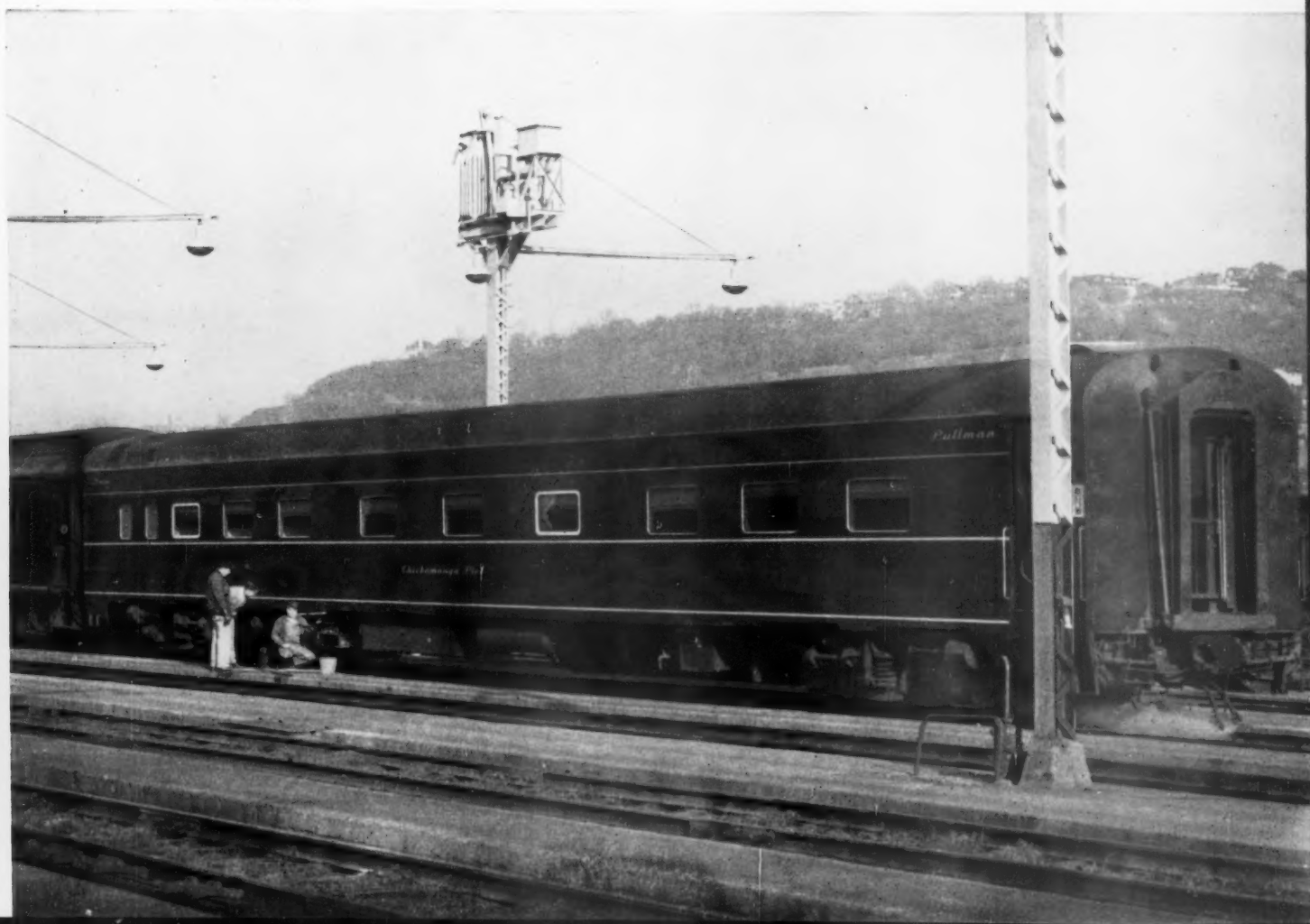
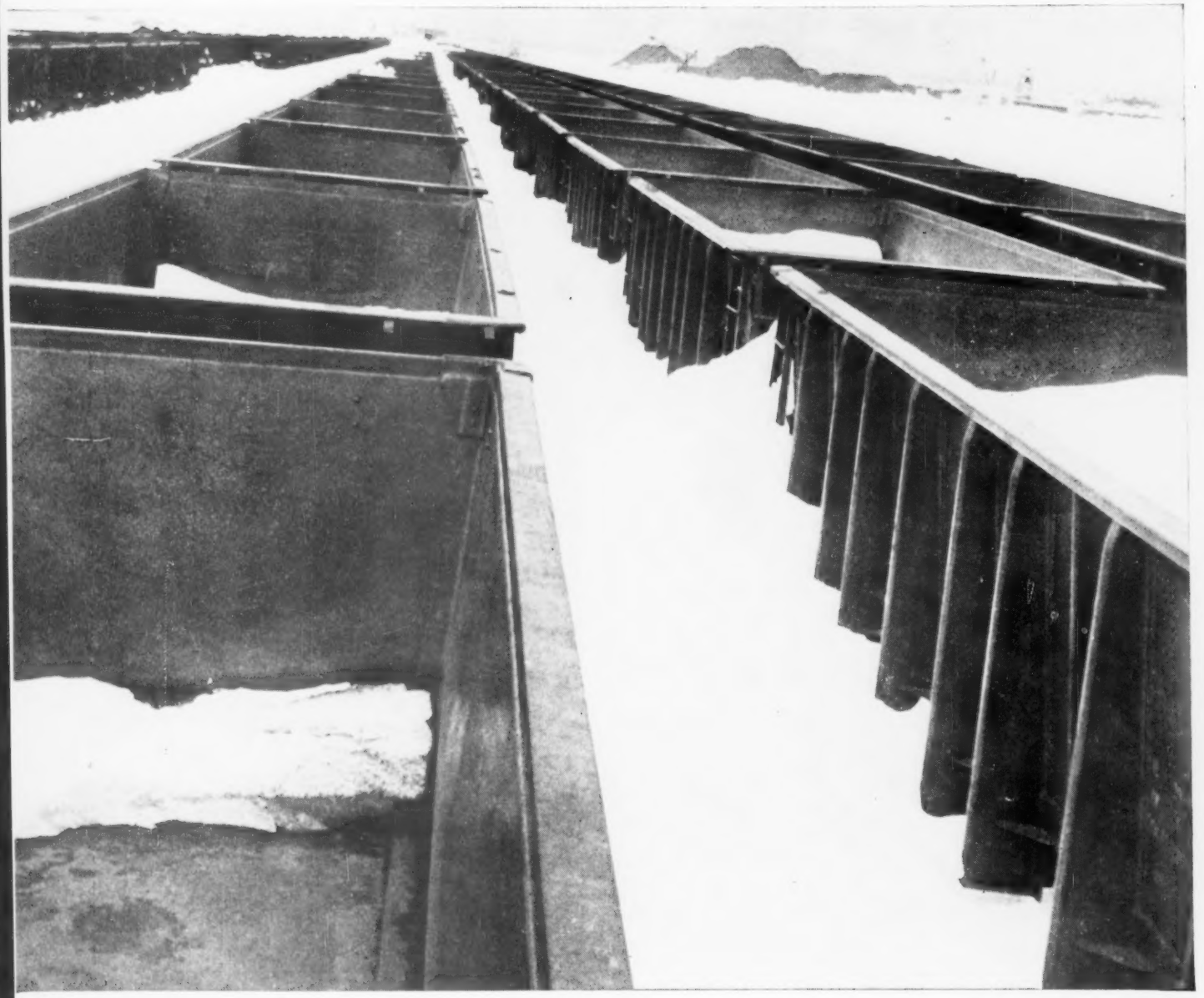
*TM



since '53 - 200,517,000* North Shore and

*As of April, 1957

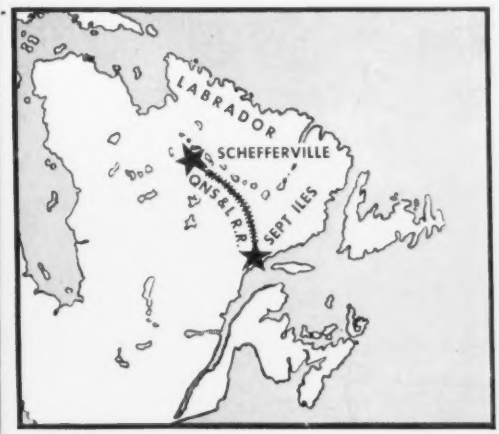


1. READY TO GO AT 50 BELOW — Quebec, North Shore and Labrador ore cars spend five months a year buried in snow and at temperatures as low as 50° below zero. Come spring, they have to be ready to roll, hauling ore from the iron mines at Schefferville, Labrador, to Sept Iles, Quebec, docks. Over 350 miles of the toughest railroad country in the world.

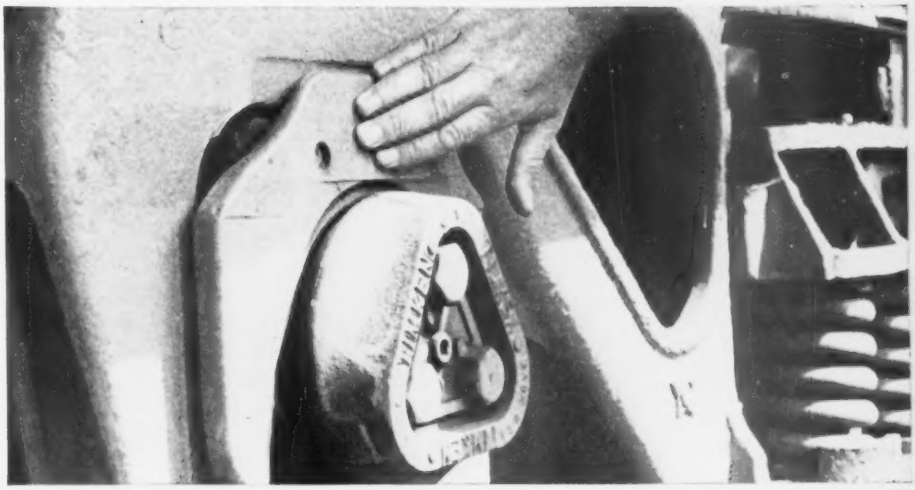
That's why QNS&L, after an exhaustive engineering study, decided in 1951 to put all of their original 2,000 95-ton ore cars on Timken® tapered roller bearings. (See reprint of 1953 advertisement—top.) Snow drifts like these and extreme cold would make major attention a must with friction bearings. With Timken bearings, sealed in grease lubrication, the cars can roll as soon as the snow is removed.

Since 1951, QNS&L has added 975 more ore cars and 28 other types of freight cars on Timken bearings. "Roller Freight" ore cars on this wilderness railroad have now rolled 200,517,000 car-miles without a single hot box. And they've helped the QNS&L pare operating and maintenance costs to the bone.

car-miles without a hot box on Quebec, Labrador 95-ton "Roller Freight" ore cars



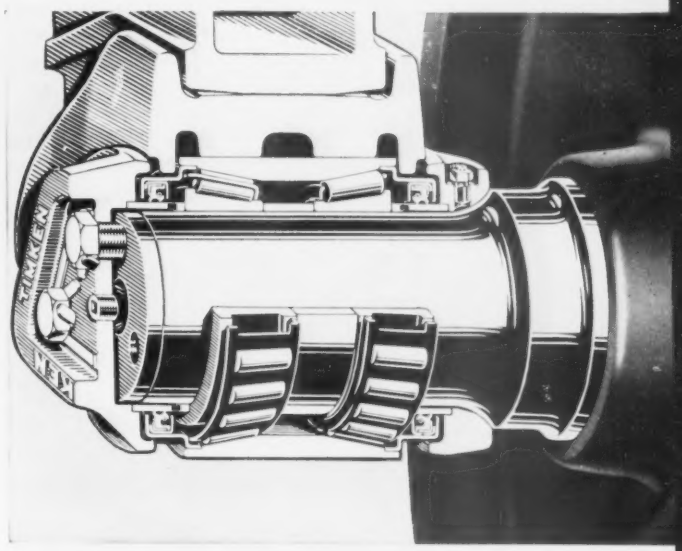
2. NO PLACE FOR A HOT BOX—Hot boxes are trouble enough in settled areas where repair and removal facilities are close at hand. In remote regions like this, hot boxes could seriously interrupt operations. Another big reason why QNS&L turned to Timken bearings to beat the hot box problem—No. 1 cause of freight train delays.



3. TOUCH AND GO INSPECTION CUTS DELAY—With friction bearings, an inspector must stop at every journal box, open the lid, poke around inside to make sure everything's in place, oil 3 out of 4. By contrast, Timken bearings (above) need just a touch of the hand—a check for temperature—as the inspector walks the length of the train. And Timken bearings can go three years without adding lubricant—cut cost of lubricant up to 95%.

4. HEAVY LOADS NO PROBLEM—Even with heavy loads on new track, the QNS&L ore cars meet schedules, exceed seasonal quotas. Because Timken bearings are tapered, they take the heavy loads from any direction—actually *roll* the load. Rollers can't skew or scuff. There's no lateral movement to force out lubricant. Operating and maintenance costs are cut to the bone.

"Roller Freight" is really rolling. 58 railroads and other freight car owners now have over 23,000 freight cars on Timken bearings in service or on order—over ⅓ of them in interchange. The Timken Roller Bearing Company, Canton, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



TIMKEN

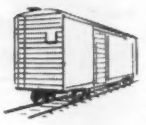
TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS ROLL THE LOAD

SAVINGS FACTS:

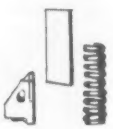
FACT No. 1

Barber Stabilized Trucks save maintenance costs. When it's necessary to service *Barber* parts, the friction castings and side springs are removed and replaced *5 to 10 times faster* than those of any competitive truck.



FACT No. 2

Barber Stabilized Trucks protect your equipment. Their unique system of suspension absorbs and eases . . . by friction . . . the destructive vertical shocks and bouncing as well as the lateral forces which usually result in dangerous nosing and swivelling.



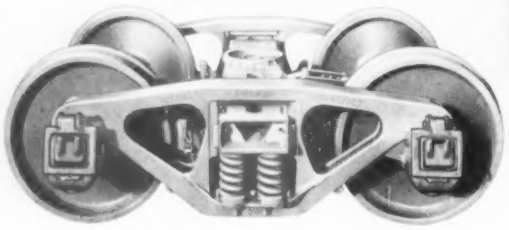
FACT No. 3

Simplicity and durability in action! Barber's three sturdy parts . . . the special *friction shoe*, the *wear plate* and the *side spring* . . . can be inspected at a quick glance. Fewest possible working parts require less attention, do a better job.

FACT No. 4

Barber Stabilized Trucks save on damage claims. They provide *the* smoother ride for ladings. Simply stated, Barber Stabilized Trucks provide variable friction for variable loads. No over-solid spring blows! For smoother-riding freight cars, insist on Barber.

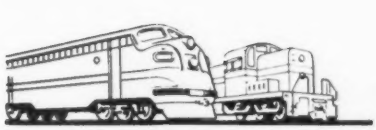
Specify Smoother-Riding



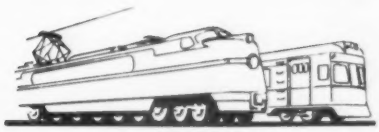
BARBER

Stabilized Trucks

Standard Car Truck Company
332 S. Michigan Ave., Chicago 4, Illinois
In Canada
Consolidated Equipment Co., Ltd., Montreal 2



DIESELS



ELECTRICS

MU CARS

ALL can have EXTRA, TROUBLE-FREE MILEAGE with Magnus traction motor support bearings

EVERY make and model of diesel-electric and electric locomotives or MU cars ever built can take advantage of the extra precision and trouble-free performance of genuine Magnus HIGH MILEAGE traction motor support bearings. These super-precision replacement bearings, designed and built by bearing specialists, can be obtained by any Railroad directly from Magnus Metal Corporation.

Each of the features at the right makes an important contribution to that extra safety factor found only in Magnus traction motor support bearings. And the present-day trend to higher mileage between motor overhauls call for this added cushion against costly breakdowns.

What's more, Magnus high-speed, high-precision production methods can manufacture these bearings so economically that relining or rebuilding is both unnecessary and impractical.

For the complete story on Magnus HIGH-MILEAGE traction motor support bearings, write for your free copy of Bulletin No. 6000, Magnus Metal Corporation, 111 Broadway, New York 6, or 80 E. Jackson Blvd., Chicago 6, Ill.

FEATURES

1. Perfectly mated bearing halves
2. Heat-resistant Satco lining metal
3. Interchangeable double keeway
4. High strength brass backs
5. Improved flange fillet profile — no "feathering," no "riding."
6. Precision finish boring to extremely close tolerances.

OTHER MAGNUS PRODUCTS FOR DIESEL LOCOMOTIVES

Wheel Flange Lubricators

Safety Valves

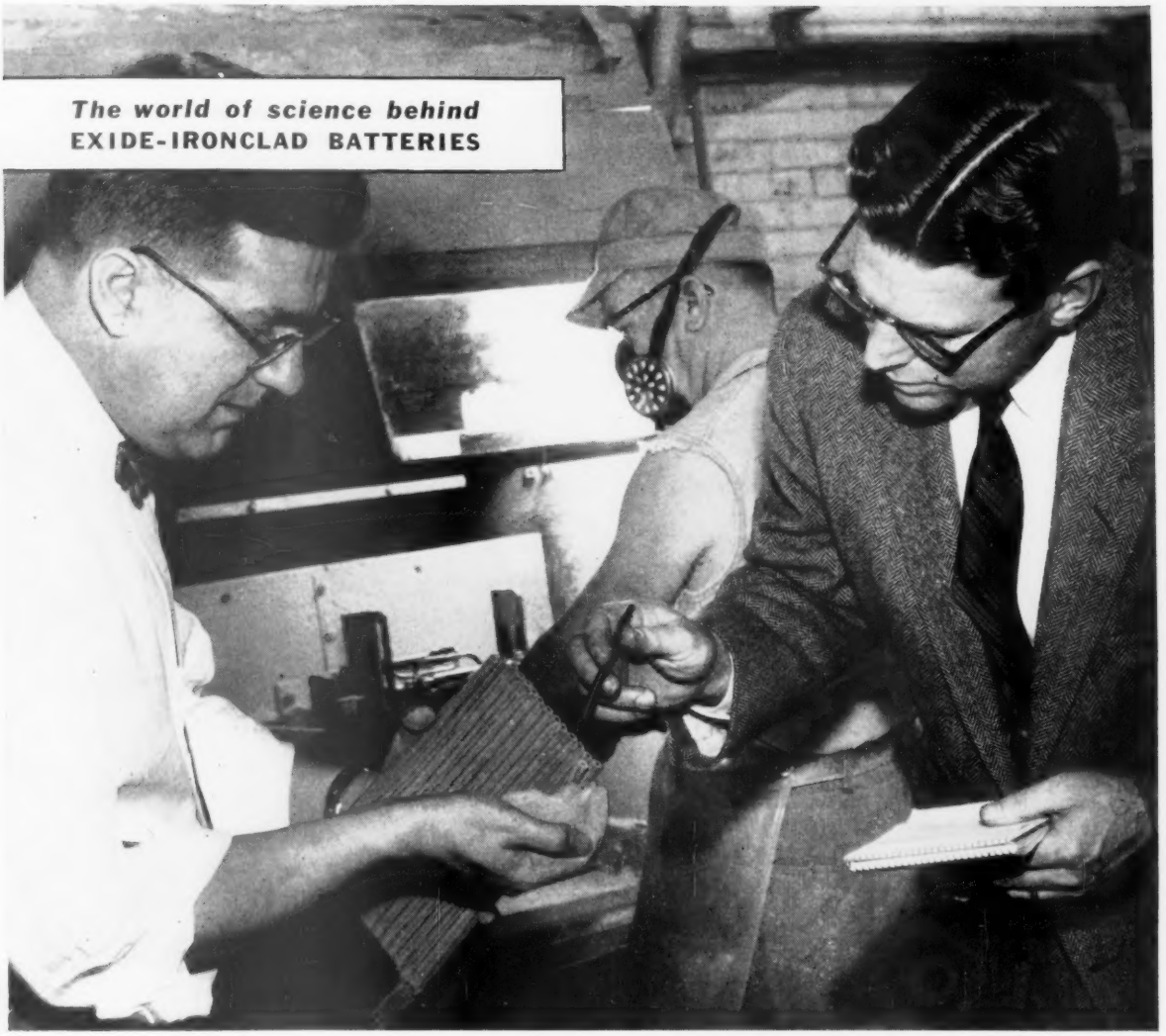
Fuel Tank Sight Gages

MAGNUS

High Mileage

TRACTION MOTOR SUPPORT BEARINGS

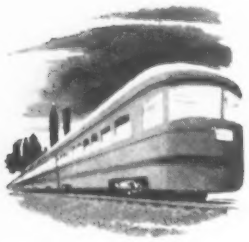
MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**



Being interviewed is E. A. Wagner, Product Engineer

"This oxide blend packs more power per ounce"

At the Exide Laboratories—**Reporter:** More power, Mr. Wagner? Do you mean the blend of oxides in Exide-Ironclad is different from that used in other batteries?



Wagner: Absolutely. We can use the more active oxides that give the batteries higher capacity.

Reporter: Why do you say *can?* Can't other batteries use these oxides too?

Wagner: It isn't likely. First, this blend is the result of more than 40 years of Exide research—and it's an Exide exclusive. Second, we can use it successfully because of the unique tubular construction of the Exide-Ironclad positive plate.

Reporter: How does tubular construction help make it a better battery?

Wagner: Because the cylindrical power tubes hold the tiny oxide particles firmly in electrical contact clear through the charge and discharge cycle. So Exide-Ironclad Batteries can maintain their high capacity—even under severe vibration—for years of service.

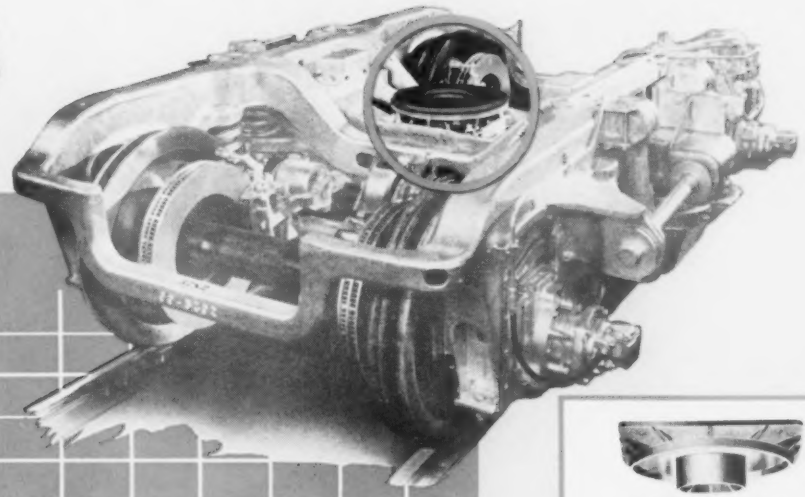
Reporter: Obviously, this is an important feature of Exide-Ironclad Batteries.

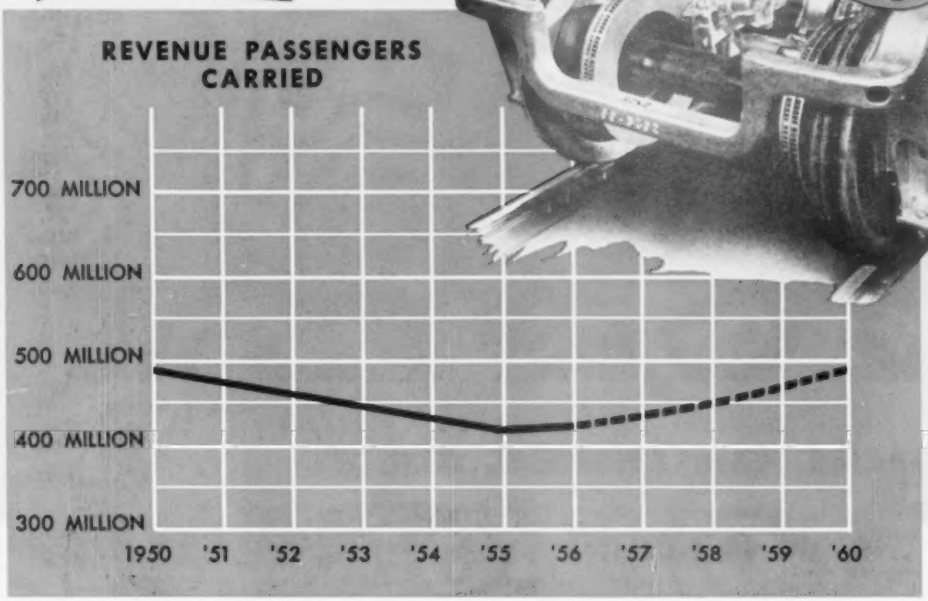
Wagner: Yes it is, but it's just one of many engineering details that contribute to its high capacity and long life.

Note to battery users. Whenever you order heavy duty batteries or the equipment that requires them, be sure to specify Exide-Ironclad. For bulletin, write Exide Industrial Division, The Electric Storage Battery Co., Phila. 2, Pa.

THE ELECTRIC STORAGE BATTERY COMPANY Exide®

Reverse the Trend in Your Passenger Revenue





Provide Greater Passenger Comfort with Commonwealth Central Bearings

Better riding of sleeping cars, diners and coaches means more comfort, attracts more passengers and increases your revenue.

Central Bearings which occupy the space formerly used by center plates provide a simple, positive way to assure smoother, more comfortable riding of existing cars, as well as new equipment. They eliminate lateral shimmy and side bearing problems. In addition they increase mileage between wheel turnings, decrease maintenance expense.

*Available in a simple easy-to-install package—Central Bearings are readily applied to existing cars.

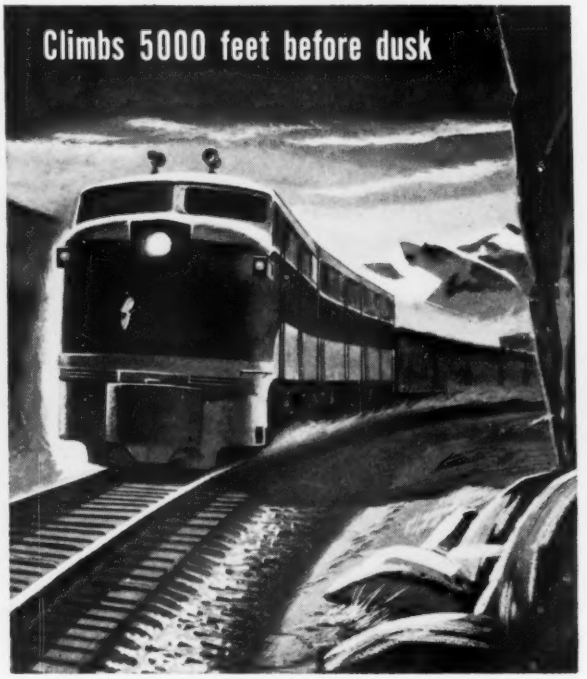
To attract more passengers—increase revenue and lower costs—use Commonwealth Central Bearings.

GENERAL STEEL CASTINGS

GRANITE CITY, ILL. • EDDYSTONE, PA. • AVONMORE, PA.

GEARED TO PROGRESS
P R I
MEMBER

This job isn't as tough as it looks...

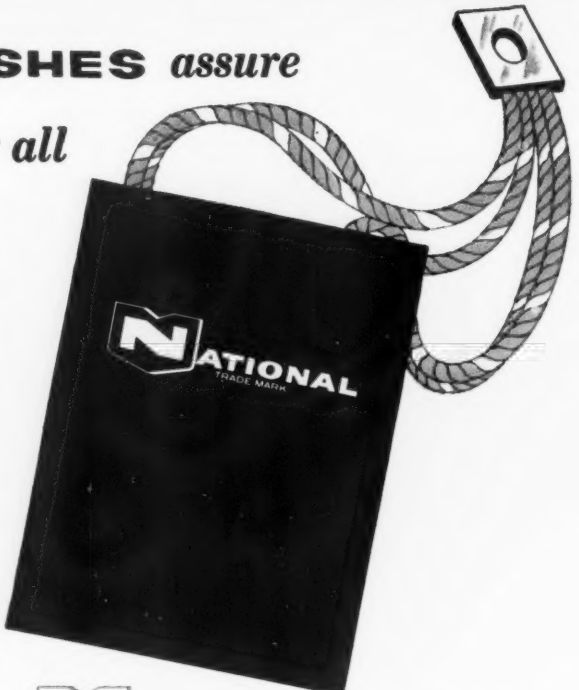


NATIONAL BRUSHES *assure*

balanced performance ***under all operating conditions!***

Long brush life, excellent commutator condition — "National" brushes assure both on all types of equipment, in all classes of service. Reason for such remarkably *balanced performance:* NATIONAL CARBON'S long-term brush development *specifically for railroads.*

Millions of test-miles prove out each "National" brush grade. And there's a fully tested brush for every diesel-electric traction motor and generator requirement. Ask your "National" brush man to show you why his brushes outsell all others combined.



BALANCED PERFORMANCE ASSURES:

LONG BRUSH LIFE — stands up under constant shock and long, hard runs.

EXCELLENT COMMUTATOR CONDITION — superior film-forming qualities preserve commutators and assure smooth, quiet running.

NATIONAL BRUSHES
TRADE MARK

Best for all types of equipment . . . preferred for all types of service

UNION CARBIDE

The terms "National", "Union Carbide" and the Silver Colored Cable Strand are registered trade-marks of Union Carbide Corporation

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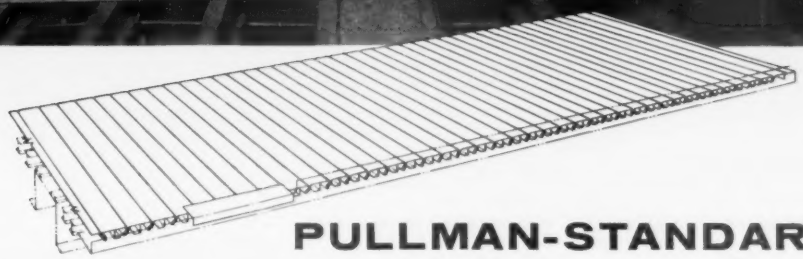
Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco. *In Canada:* Union Carbide Canada Limited, Toronto



PULLMAN-STANDARD

NAILABLE STEEL FLOOR

provides 33% more nailing space... plus exceptional nail holding power

Cost and service conscious railroads all over the Great American Railway System are replacing wood decking with long-lasting, easily installed Pullman-Standard Nailable Steel Floor. Prominent carriers have over 2500 car sets of this outstanding lading and equipment protection product now in service or on order with Pullman-Standard.

Behind these users' decisions to specify Pullman-Standard Nailable Steel Floors is the knowledge that they are built to provide exceptional durability and strength plus superior nailholding power. And floor maintenance is minimized . . . cars stay in service longer. Costly floor repairs and cooperage are practically eliminated.

The P-S Nailable Steel Floor design includes ample nailing space, contributing to lading security for your shippers. 99 car-width grooves in a 50′-6″ box car and 79 in a 40′-6″ box car means 33% more nailing space than other steel floors. Permits any conventional arrangement of car bracing, blocking or bulk-heading.

For complete details on this exceptional lading protection and car maintenance-reducing product by Pullman-Standard, write for literature or contact your nearest P-S sales office.

- P-S design provides exceptional nail holding power with any size nail from 16d to 40d.
- Steel angle supports and plank joints provide floor support every three inches . . . help prevent crushing and dishing by heavy lift trucks and racks.
- P-S narrower planks on 6″ centers provide greater strength and more nailing grooves.
- P-S flexible nailing joint snaps back . . . retains original holding power even after use of 30d or 40d nails.
- 1/16″ underframe clearance built into plank joints prevents offsetting . . . planks are always level.

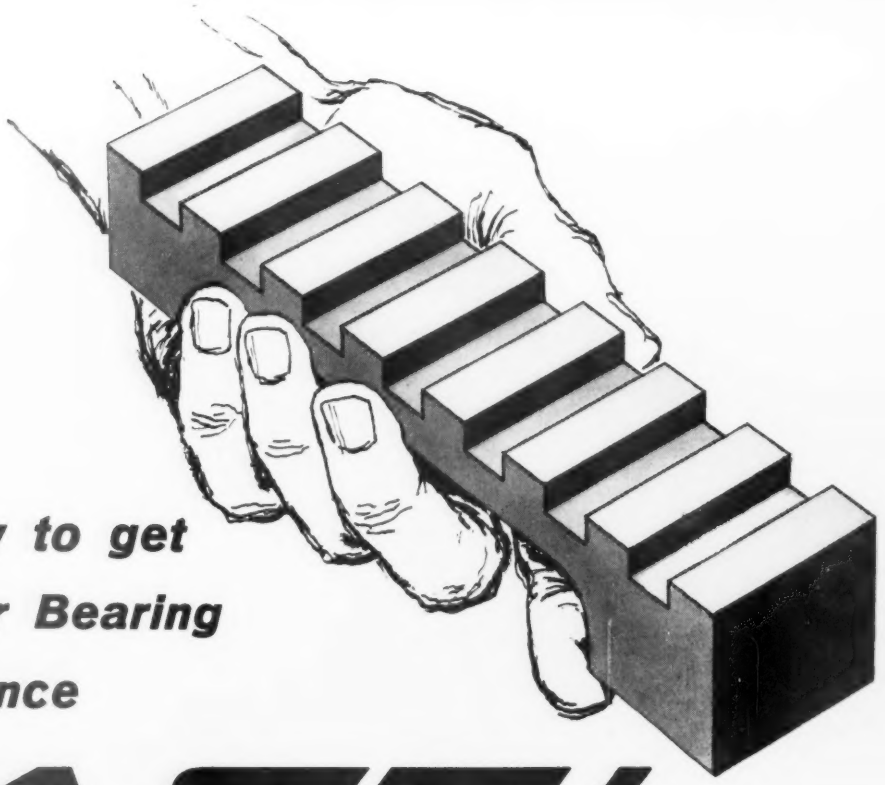
WORLD'S LARGEST BUILDER OF ROLLING STOCK

PULLMAN-STANDARD

CAR MANUFACTURING COMPANY

221 N. LA SALLE STREET, CHICAGO 1, ILLINOIS

BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON



Surest way to get Better Bearing Performance

FAST!

Railroads have accumulated 30,000 car-months of service with R-S JOURNAL STOPS — and have averaged better than 6,000,000 car-miles per set-out

MAGNUS R-S Journal Stops, bolted to the inside of the box, on either side of the journal, positively prevent excessive axle displacement even under the severest road or switching impacts. All elements of the bearing assembly are kept *in place, all the time!* You maintain a constant hydrodynamic oil film that guarantees optimum journal bearing performance.

Magnus R-S Journal Stops are now installed on more than 2,600 cars which have accumulated more than 30,000 car months of service. In this time there have been only six road failures. That's equivalent to better than 6,000,000 car miles between set-outs. You can't beat that kind of performance with any other type of freight car bearing — or any other journal bearing device.

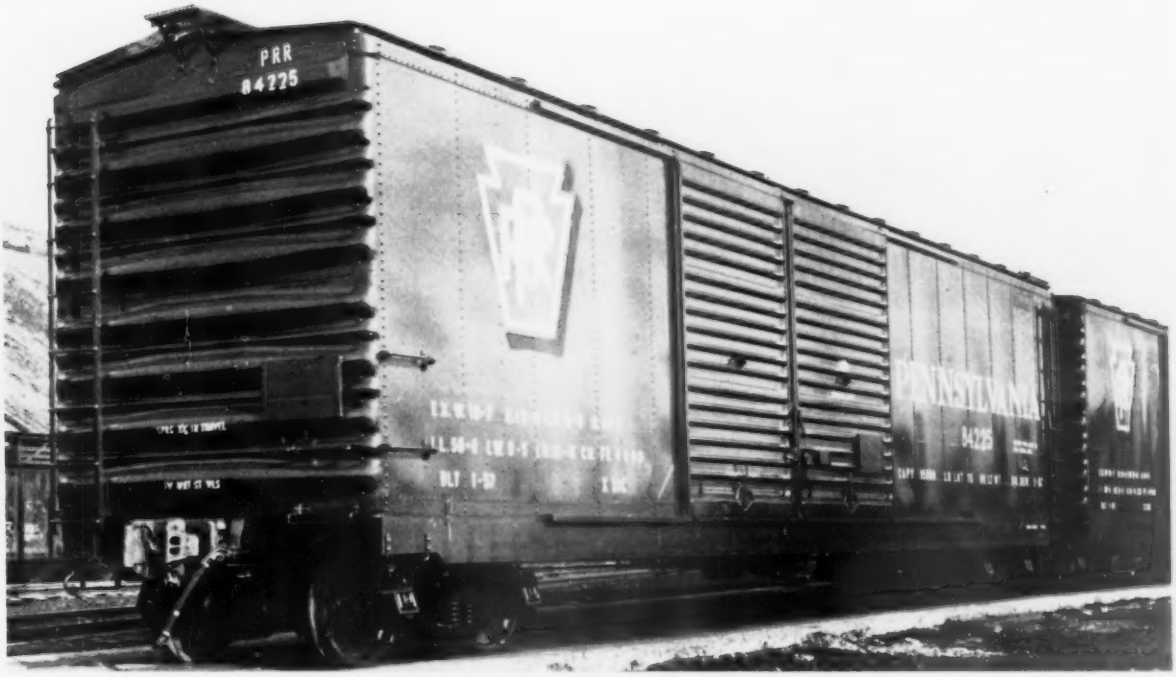
For full information on R-S Journal Stops, write to Magnus Metal Corporation, 111 Broadway, New York 6; or 80 E. Jackson Blvd., Chicago 4.

MAGNUS

Solid Bearings

MAGNUS METAL CORPORATION *Subsidiary of* **NATIONAL LEAD COMPANY**

RAILWAY LOCOMOTIVES AND CARS



The X51C car (above) equipped with Chrysler "Universal" Loaders has an average light weight of 68,100 lb. Class X51B's weigh 68,100 lb, the X51A's weigh 58,700 lb and X51 light weight is 72,600 lb.

Pennsy Box Cars Should Stay Square

Diagonal crossbearers brace the underframes of 1,600 big box cars—the first built at Samuel Rea shop.

The Pennsylvania's X51 box car building program just completed at the Samuel Rea shop at Hollidaysburg, Pa., represented two innovations. These are the first new cars to be built at Samuel Rea—the world's largest railroad-owned car shop (*Railway Locomotives and Cars, November, 1955, p. 39*). The cars themselves incorporate an innovation in freight car design—diagonal crossbearers in the underframe construction. Concerning this arrangement, H. L. Decker, PRR mechanical engineer, recently stated, "To our knowledge, this underframe design incorporating diagonal crossbearers is original with the Pennsylvania Railroad."

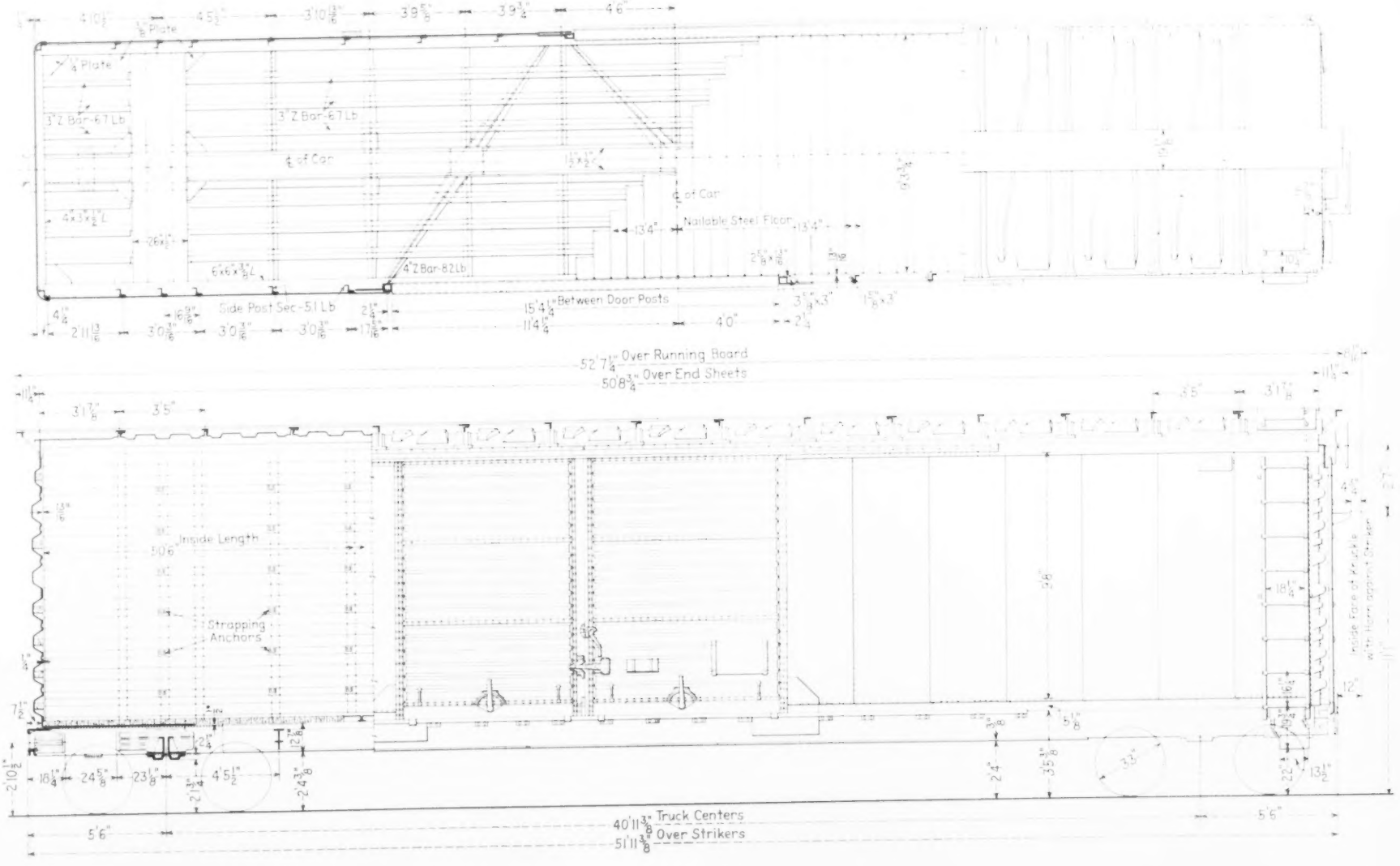
The X51 program called for the building of 1,600 of these 50-ft double-door cars. The diagonal crossbearers are intended to transfer the load to the side sills at locations where the full strength of the car can be utilized. This eliminates the transfer of concentrated loads from the center of the car to the side sills in the door openings as is done with the normal type of crossbearer construction. Also, the diagonal crossbearers serve to better absorb, and distribute into the car body, buffing shocks which result from excessive coupling speeds and slack action in trains.

Theoretically, this type of underframe construction should provide a solid foundation which will keep the car body square and the floor of the car in a horizontal plane. At the present, the Pennsy is unable to

(*Text continued on page 39*)

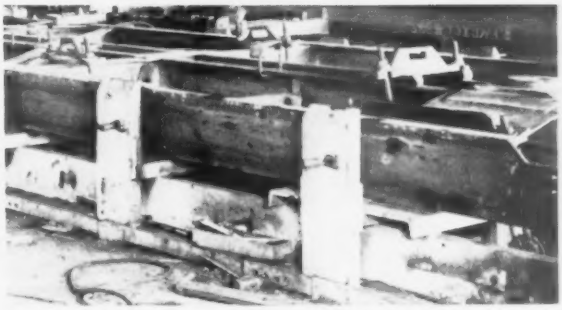
NEXT PAGE: CAR PLAN ►

THIS IS THE PENNSY'S X51A DESIGN



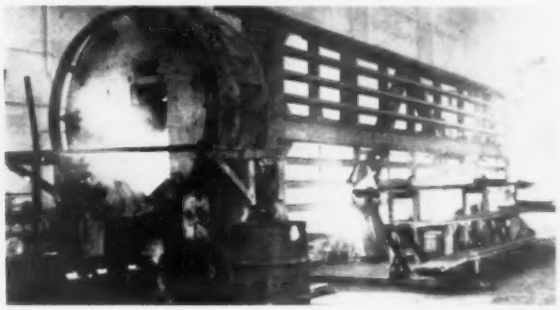
PENNSY PRODUCES ALL-WELDED X51 UNDERFRAME . . .

Center sill Z sections are welded with Lincoln submerged arc process at Altoona and are then moved to the Rea shop for assembly.



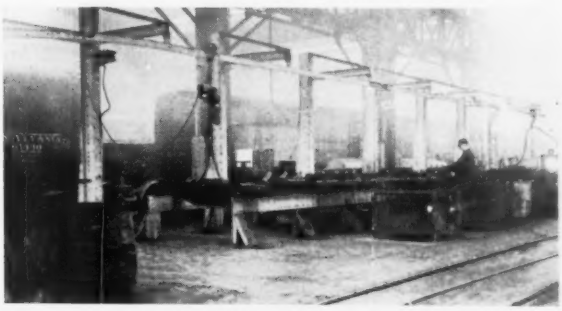
Underframe assembly jig holds subassemblies and other components necessary to produce the diagonally-braced underframe.

Tack welding throughout and some final welding are performed while the underframe components are in the assembly jig.



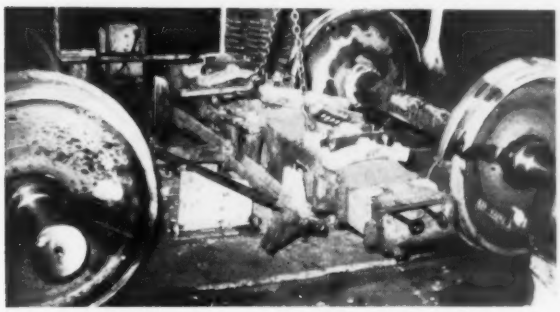
Tumble jig positions tacked underframe assembly so that the finish welding can all be completed in downhand position.

PRR HAS PRODUCTION LINE TRUCK ASSEMBLY . . .

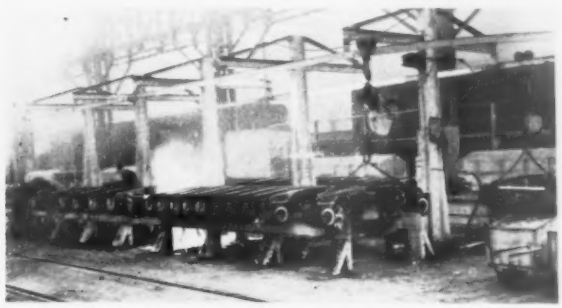


Bolster assembly line installs ride control, side bearings and dead levers fulcrums. Tramrail-mounted hoist moves bolster to assembly jig.

Truck assembly jig locates bolster, brake beams and wheels so side frames slip on. Jig folds down to roll completed truck out.

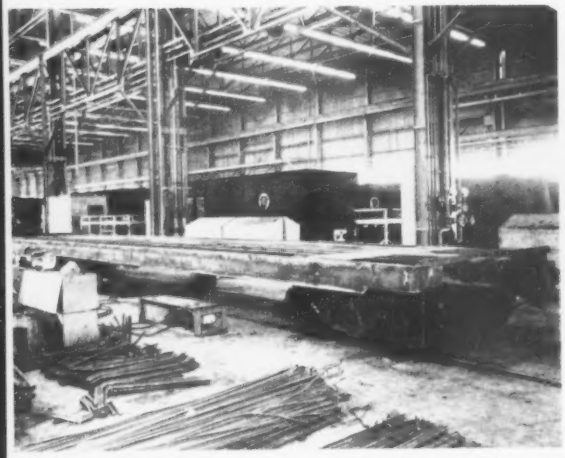


Truck building is the first operation on the box car assembly line. Pins in bolster ends secure ride control till side frames are installed.

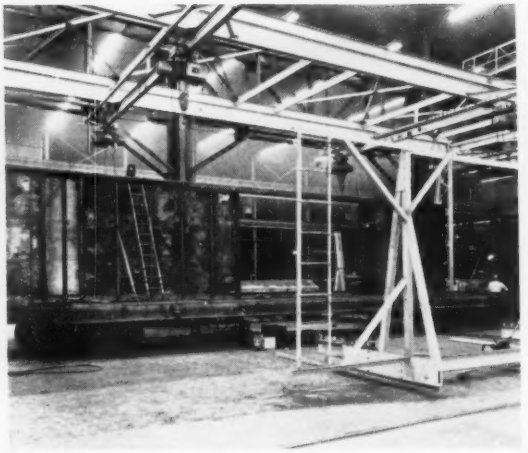


Side frame assembly installs lids, lubricators and dust guards. Separate hoists move up the truck's two side frames to parts on assembly jig.

THIS IS X51 PRODUCTION LINE AT SAMUEL REA



Underframe is placed on trucks with overhead cranes. Major portion of the air brake equipment is applied at this position.

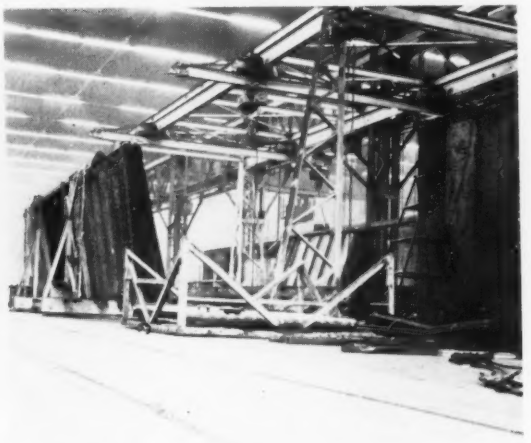


Side assemblies are each hung with two electric hoists which move them in from storage racks on each side of the assembly track.

STEP 1
Put underframe on trucks. Air brake parts and piping applied.

STEP 2
Apply, fit up, and ream sides on underframe. Weld gussets at doorways.

Side assembly is three-position operation. Sides are rolled from fitting-up position to be reamed and finally to be driven.



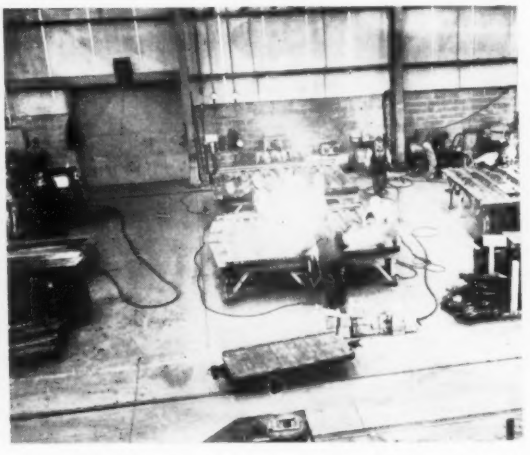
Sides and ends are stocked in racks ready to be applied to cars as they proceed down the assembly line. Sides are applied first.

STEP 3
Apply, fit up, and ream ends.

STEP 4
Apply, fit up, and ream roof components.

STEP 5
Rivet sides at sills and ends. Drive eaves and roof components.

End assemblies are applied to both ends of car while car is at one station. This requires a separate hoist for each end.

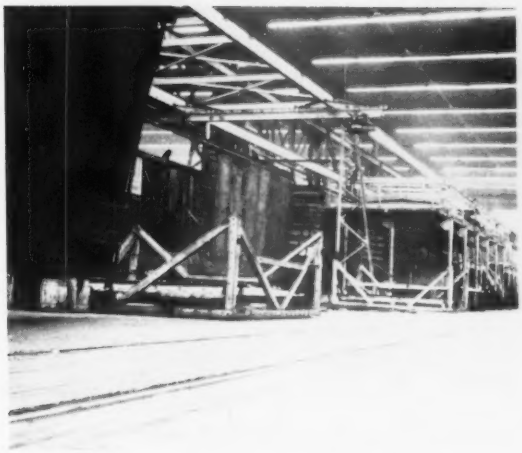


End assembly is three-step operation consisting of tack welding halves, final welding, and application of fittings including riveting.

STEP 6
Apply threshhold plates and run boards. Complete welding ends and sides to underframe.

STEP 7
Door tracks and doors applied. Finish and test the hand air brakes.

STEP 8
Clean exterior; apply cement to underframe and lower inside of sides.

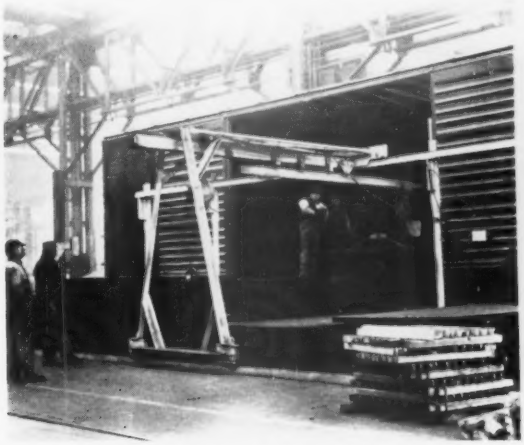


Roof panels and run boards are stocked and applied at elevated platforms just beyond side and end application. Roof riveting is done here.

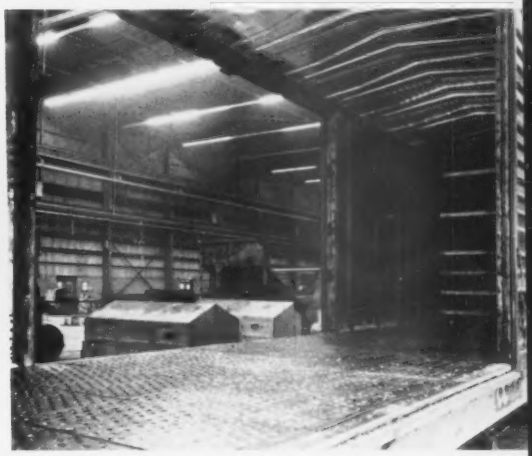
Cold riveters used on roof and running board assembly are mounted on moveable overhead carriages; they can be moved the length of the car.

STEP 9
Install nailable steel floor and weld on top at side sills.

STEP 10
Install wooden floor and the border.



Gantry-type hoist makes it possible to place the nailable steel flooring panels through a 26-ft 8-in. doorway area on most X51's.



Perforated floor plates completely covered wood floor on 500 X51 cars. Others got nailable steel floor at doorway, unprotected wood in the ends.

STEP 11
Drill, attach wood floor and plates. Complete welding nailable steel flooring.

NEXT STEP IS APPLICATION OF LOADER EQUIPMENT ►

(Continued from page 35)

fully evaluate this design because no laboratory tests have been conducted, nor have the cars been in service long enough to judge their performance. Plans have been made to conduct both static and impact tests with full instrumentation to obtain data for use in determining future freight car designs.

The center sill for the X51 cars is composed of two AAR 36.2-lb Z sections, and side sill reinforcing channels are 13-in., 31.8-lb car building sections. The side sill reinforcement provided by these large channels was necessary to maintain a low stress level at the 15-ft free span of the doorway opening. Conforming with the latest AAR requirements, the cars have three 3-in., 6.7-lb Z-section floor stringers on each side of the center sill. These stringers are continuous from bolster to bolster and are attached not only to the conventional crossbearers and crossties, but to the diagonal crossbearers as well.

Car Classes Differ

There are four groups of cars of the X51 type in this building program. Most of them are being assigned to automobile parts service and are fitted for this purpose. The 1,600 cars are equipped as follows:

- Class X51, 500 cars, are wood lined only at the ends and have 2⅜-in. wood floors throughout covered with $^{3}/_{16}$-in. perforated steel plates. The cars are equipped with 19 belt rail Evans "DF" loaders for automobile parts service. Type F couplers are used on 281 cars and Type E couplers are used on the remainder.

- Class X51A, 398 cars, are wood lined throughout and have 72 flush-type lading strap an-

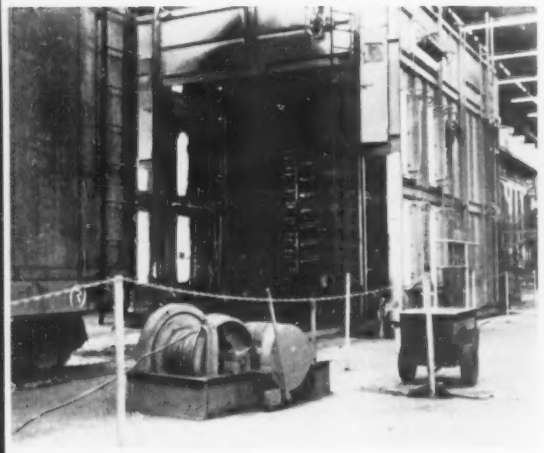
Auto parts loaders are applied through series of assembly stations on X51 assembly line after the car itself has been completed.

Jigs are used to assemble the side and end lining boards into sections before application to the car. All cars were lined at ends.

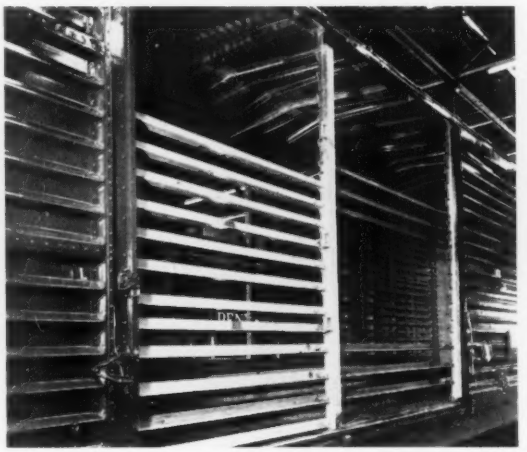
STEP 12
Install special loader devices or side lining.

STEP 13
Apply the end lining.

STEP 14
Apply coating on steel flooring.



Binks traveling paint spray booth has reduced exterior finishing of the X51 cars to matter of minutes. Winches move cars on production line.



After the "DF" loader equipment is installed, interiors of X51 cars are spray painted, including steel floor but not galvanized roof.

STEP 15
Spray painting of interior.

STEP 16
Exterior painted in the traveling spray booth.

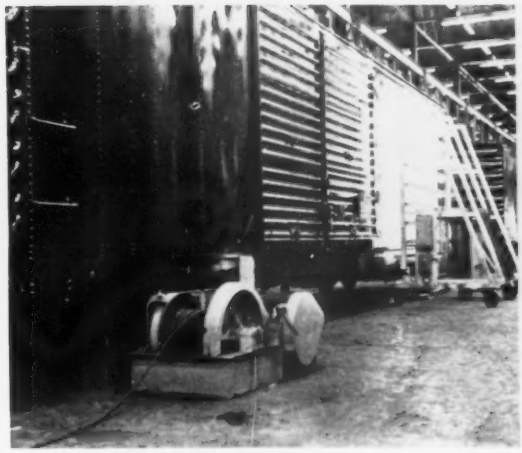
chors on the intermediate side posts and 36 additional anchors incorporated in the door posts for general service. Nailable steel floors in the doorways for a distance of 26-ft 8-in. and unprotected 2⅜-in. wood flooring covers the remainder of the car. All cars have Type F couplers.

• Class X51B, 202 cars, are wood lined at ends only and have the same floor used in the X51A cars. This series is equipped with 18 belt rail Evans "DF" loaders for automobile parts service, and all cars have Type F couplers.

• Class X51C, 500 cars, are end lined only and have the same floor used in the X51A cars. The cars are fitted with Chrysler-design "universal" loaders for automobile parts service and 219 of them have Type F couplers.

The cars were assembled at Samuel Rea shop at the rate of twelve per 8-hr day during much of the production run. Center sills complete with fillers, draft stops and strikers were assembled at the steel shop at Altoona works. Bolsters and diagonal crossbearers were assembled at the Juniata welding shop. These subassemblies went into the underframe assembly jig at the Rea shop along with the side sill channels, end sills, regular crossbearers, cover plates, couplers and draft gears. Angles, channels and plates are all cut, shaped and punched at Altoona works. The Rea shop only performs assembly oper-

STEP 17
Infrared drying of areas to be stencilled.

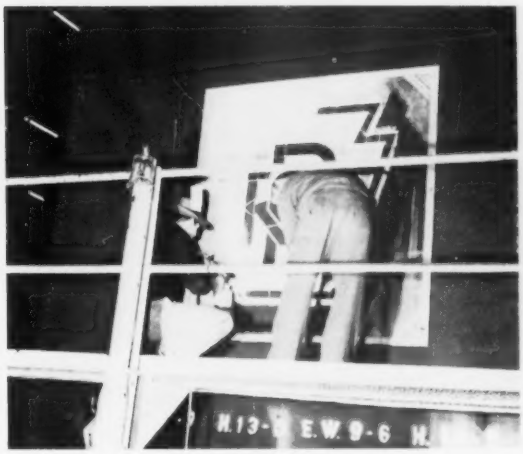


Infrared lamp banks are rolled up to each side of the car to dry areas to be stencilled. Lamps are about 2-ft from car side.

STEP 18
Spray exterior and interior stencilling.

Stencilling station has platforms and spray equipment for rapid application of the large emblem and lettering now standard on Penncy.

STEP 19
Final inspection and necessary corrections.



Spray stencilling is applied through patented stencils held against the car side with series of small permanent magnets.

STEP 20
Weight car and complete the stencilling.

Ready for weighing and shipment, Pay Loader tractor with couplers moves the completed X51's from the east end of the Samuel Rea shop.

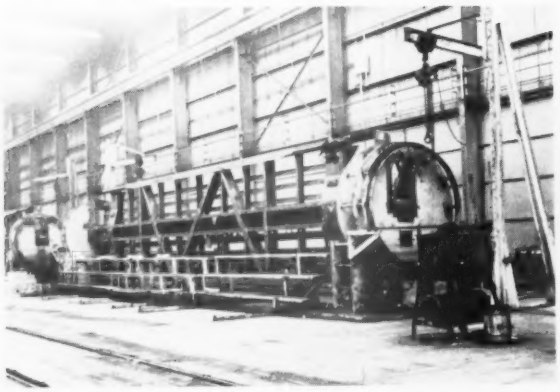
STRUCTURAL DETAILS AND SUPPLIERS FOR X51 BOX CARS ►

ations, and the X51 underframes are welded throughout. All steel ½-in. thick or less in these cars is copper-bearing steel.

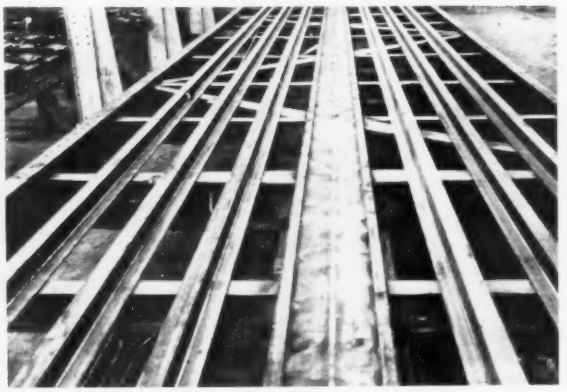
Much of the production line stocking was performed after the daily 8-hr assembly operation had stopped. This work was done by the overhead cranes which cover the 2,760-ft production line, and by lift trucks and tractor trains. Most of the subassembly operations can be serviced by traveling, wall-mounted cranes which do not tie up the overhead traveling cranes. This frees overhead traveling cranes for moving completed underframes, sides, ends and other heavy parts to the assembly operation as those parts are produced or needed. Cranes and hoists are also provided at many of the assembly stations. The adjacent tracks in the main bay of the Rea shop are utilized as production lines for the repair of box, gondola and hopper cars, and are operated in a manner similar to that for the new cars.

All of the 1,600 X51 type cars are equipped with ride control trucks having $3^{11}/_{16}$-in. travel springs. Unit brake beams, and AAR approved journal box lubricators. These cars have an inside length of 50 ft 6 in., an inside height of 10 ft 6 in. The inside width varies from 9 ft 2 in. for the Evans "DF" loader equipped cars to 9 ft 4 in. for the Class X51A general service box cars. The Class X51A cars have a cubical capacity of 4,994 cu ft.

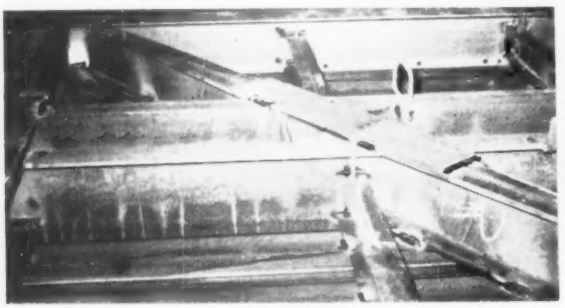
DIAGONAL CROSSBEARERS GET LOADS AWAY FROM X51 DOORWAYS



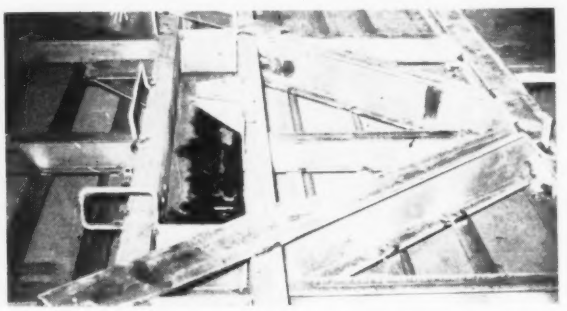
Diagonal crossbearers in underframe show plainly while assembly is held vertically in welding jig at the Samuel Rea shop.



Floor stringers are continuous from bolster to bolster. They are supported, welded at all cross members including diagonal crossbearers.



Non-continuous, diagonal crossbearers are aligned across center sill and have channel spreaders inside sill.



Cover plate across the bottom of the center sill connects flanges of the two separate diagonal crossbearer assemblies.

Specialty Suppliers for X51 Cars

Ajax Consolidated Co.:
Handbrakes

Alco Products, Inc.:
Journal Box Lids

American Brake Shoe Co.:
Brake Shoes

American Steel Foundries:
Bolsters, Couplers, Side Frames, Yokes, Strikers, Brake Beams

Apex Railway Products Co.:
Running Boards, Brake Steps

Birdsboro Steel Foundry and Machine Co.
Bolsters, Side Frames

Broen Metal Products, Inc.
Loader Equipment

Buckeye Steel Castings Co.:
Bolsters, Couplers, Side Frames, Yokes, Strikers, Center Fillers

Buffalo Brake Beam Co.:
Brake Beams

Cardwell Westinghouse Co.:
Draft Gears

Central Railway Supply Co.:
Pipe Clamps

Chicago Malleable Castings Co.:
Brake Beams

Chicago Railway Products Co.:
Brake Beams

Continental Foundry & Machine Co.:
Strikers, Center Fillers

Davis Brake Beam Co.:
Brake Beams, Journal Box Lids

Evans Products Co.:
Loader Equipment

Klasing Handbrake Co.:
Hand Brakes

MacLean Fogg Lock Nut Co.:
Lading Strap Anchors, Threshold Plates

McConway & Torley Co.:
Couplers, Yokes, Strikers

Miller Lubricator Co.:
Journal Lubricators

W. H. Miner, Inc.:
Draft Gears, Handbrakes

Morton Manufacturing Co.:
Running Boards, Brake Steps

Motor Wheel Corp.:
Journal Box Lids

National Brake Co.:
Handbrakes

National Malleable & Steel Castings Co.:
Bolsters, Couplers, Side Frames, Yokes, Strikers

Peerless Equipment Co.:
Draft Gears

Pittsburgh Steel Foundries:
Side Frames, Bolsters

Schaefer Equipment Co.:
Trucks Levers and Spreaders

Security Railway Company:
"Journa-Pak" Journal Lubricators

Standard Railway Equipment Co.:
Uncoupling Devices, Roofs, Ends, Perforated Floor Plates

Stran Steel Division, National Steel Corp.:
Nailable Steel Floors

A. Stucki:
Side Bearings

Symington Gould Corp.:
Bolsters, Couplers, Yokes

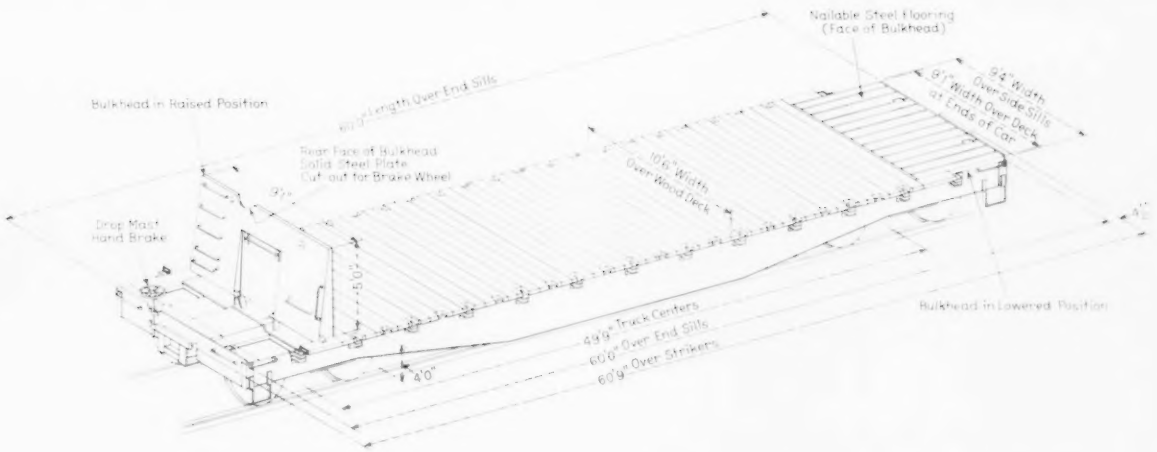
Universal Railway Devices Co.:
Handbrakes

U. S. Gypsum Co.:
Running Boards, Brake Steps

Waugh Equipment Co.:
Draft Gear, "Ply-Pak" Journal Lubricators

Whitehead and Kales Co.:
Loader Equipment

Youngstown Steel Door Co.:
Doors



Counterbalanced bulkheads can be handled by one man. Locking arrangement secures them in the raised position. Car has been designed so floor is at regular height.

Rock Island Builds . . .

Flat Car with Disappearing Bulkheads

Car fitted with folding ends is able to handle variety of loads

The last order of 70-ton, 60-ft flat cars, built new by the Rock Island at the Blue Island shops, included one car with hinged bulkheads, one at each end of the car. With the bulkheads down, the entire floor of the car is flush for conventional loads. With the bulkheads up, lumber and other materials can be carried with full protection at the ends. Two AAR classifications fit the car now. As a flat car, it would be designated "FM," and, with the bulkheads up, it would be "LP." Recent shipment of bulldozers to the west coast with it as an "FM" car and a return load of lumber with it as an "LP" car point up double-duty usage.

Hinged Bulkheads

The bulkheads, 9 ft 1 in. wide, are hinged 5 ft 8 in. from each end of the car and are 5 ft in height in raised position. There are 9 in-line hinges at the bottom of each bulkhead and a 9-ft 9-in. long, 1½-in. diameter hinge pin for each bulkhead, connecting to floor hinges.

Counterbalanced Ends

Six counterbalance springs are fastened at the bottom of each bulkhead, three on each side of center line of car. The tension is so adjusted that one man can easily raise or lower the bulkhead in position. When the bulkhead is in raised position, it is locked in place by four traverse locking bars, two on each side, actuated by a pinion gear meshing with gear teeth on the locking bars. A crank, provided for movement of the pinion gear, causes the locking bars to move in opposite directions, engaging the sides of the car and a plate attachment to the center sill for locking.

When the bulkhead is in lowered position, a cam and latch arrangement at the end of the car provides positive locking in place to the end sill. There are two bulkhead locks on each end of the car.

The top surface of each bulkhead in lowered position is covered with nailable steel flooring. The rear face of the bulkhead is $^{3}/_{16}$-in. steel plate, equipped with grab irons and stake pockets. The bulkhead at one end of car is cut out at top for hand brake wheel clearance.

Special shallow-type body bolsters were used to provide clearance for the bulkhead wells.

Wood Decking

Treated gum decking is used for flooring between these bulkhead wells. There are 12 "MF" lading anchors per side between the stake pockets, which number 17 per side.

The trucks have 6 by 11 journals, one-wear 33-in. cast-steel wheels, unit brake beams and roller side bearings. Rubber draft gears are used, and the brake equipment includes an automatic slack adjuster.

Pistons start into cleaning tank. Aja-Lif provides up-and-down movement insuring removal of oily coating.

Piston, dried after hot water rinse, ready for cleaning by combined action of steam jets and grit abrasive.

Here's How the Milwaukee . . .

One man and production line methods, using the Vapor Blast Liquid Honing machine, gets 32 pistons cleaned per day. This contrast with 8 to 10 per day by hand cleaning depending on the condition of the pistons, and not getting a thoroughly clean job. To get the same production as the machine would require 3 to 5 men.

The pistons are brought in on skids, and the rings are stripped off. A basket containing 20 pistons is set in a Magnus Aja-Lif cleaning tank, where an up-and-down motion washes them for 15 minutes at 190 deg. F. in cleaning solution.

After washing, the pistons are rinsed in hot water at 190 deg. F., placed on skids and dried.

Removing the carbon from the bottom of the ring grooves previously had been a long process with hand tools.

This problem was solved by a shop-made device, consisting of two half-moon 2-in. pieces of steel plate, hinged at one end and handles on the other. Carbide inserts were placed 120 deg. apart and a width suitable for the grooves. A couple of rotations of this device and the job is done.

Liquid Honing

Each piston is then placed in the liquid honing machine for 10 min. Three fixed abrasive guns, using No. 100 grit, move up and down automatically over the piston as it rotates. One gun cleans the outside, one the inside, and the third is used for "high-spotting" and cleaning the piston crown. A hand operated gun can be directed by the operator through an observation window to remove stubborn deposits. The machine is self-contained, requiring only air, water, power and exhaust connections.

After the cleaning operation, the piston is rinsed in hot water containing anti-rust inhibitor, inspected for cracks by magna-glo and checked for size and general condition. New rings are applied, and the piston is either stored or used in the shopping program.

The valves follow generally the same routine of cleaning as the pistons. They are brought in the shop in baskets, and cleaned with heavy cleaner. After drying they are placed in a fixture for 10-min. in the liquid honing machine.

Because the valve head diameters vary, three special shop-made fixtures were made to hold the valves and position them for cleaning. Thirteen EMD valves, 7 Alco and 6 Baldwin can be cleaned, each set

Operator uses hand jet to remove stubborn film.

Cleaned piston gets bath in hot water containing anti-rust inhibitor.

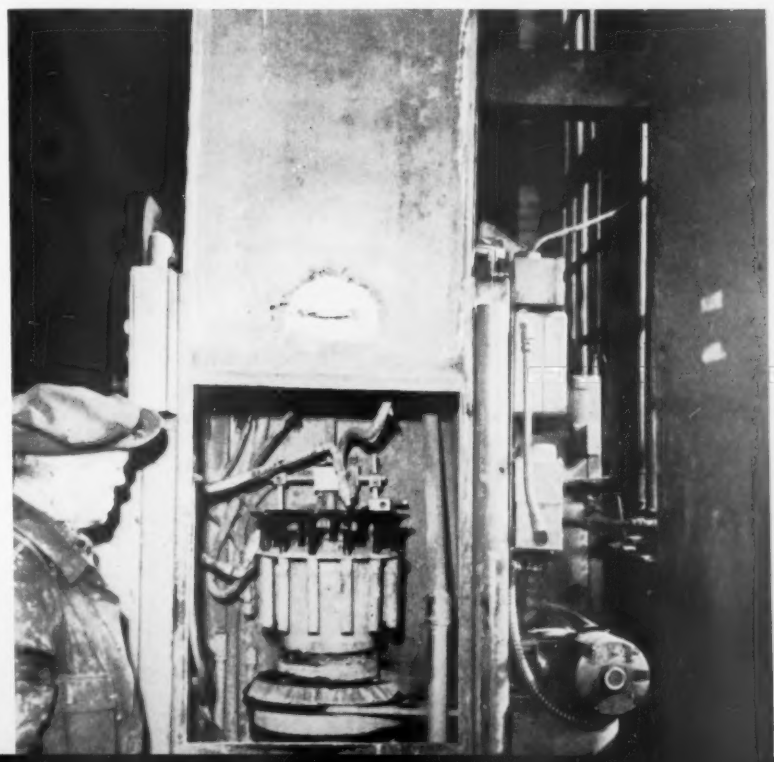
Cleans Diesel Engine Pistons and Valves

at a time. With this operation, for example, it is possible to get 480 EMD valves in an 8-hour operation. Previous production by sand-blasting was 70 to 80 in the same period.

Checking for Cracks

After cleaning, the valves are dried and the seats ground. The last step is to check for flaws and Turco's No. 30 Dy-Chek Kit is used. The heads of the valves are dipped in a non-water soluble red dye penetrant, washed with a remover emulsifier and allowed to dry. The emulsifier makes the surface of the valve water soluble and removes the excess penetrant from the surface. A white developer is sprayed on the valve seat, and if there are any cracks, the red color which has penetrated the cracks shows up through the white coating.

EMD valves positioned on rotating table in Liquid Honing machine.



Eleven Years' Service Tests Produce . . .

Standardized PS-5 Gondola

Pullman-Standard Car Manufacturing Company has announced its fifth standardized freight car, the PS-5 gondola. It is now available in the basic 70-ton, 52-ft 6-in. size, or the 70-ton, mill type of 65-ft 6-in. length.

"Development of this gondola resulted from exhaustive design and engineering tests conducted in conjunction with the St. Louis-San Francisco railroad, the Rock Island and Pullman Standard," C. W. Bryan, Jr., president of the company said.

The Frisco received 400 of the basic type design in 1949 and the Rock Island 300 of the mill type in 1953. Results of service tests plus P-S standardization concepts, led to its addition to their car fleet.

The basic gondola underframe consists of two 41.2-lb. "Z" sections welded the full length of car to form the center sill. The bolster center filler is P-S built-up and arcwelded design. There are six built-up, arcwelded cross bearers, with four pressed plate crossties and two I-beams included in the construction.

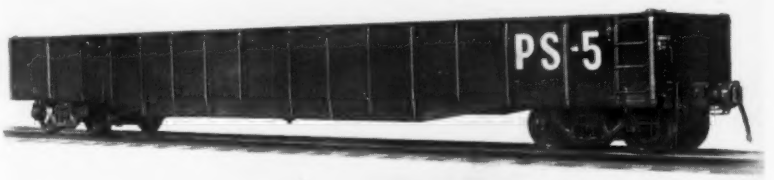
Copper Bearing Steel

The floor is $^3/_8$-in. copper bearing steel plate, butt-welded together on top of the underframe cross members and designed to withstand severe impacts and loads without excessive dishing. Floors can also be furnished of wood, a combination of wood and steel, and the P-S nailable steel floor.

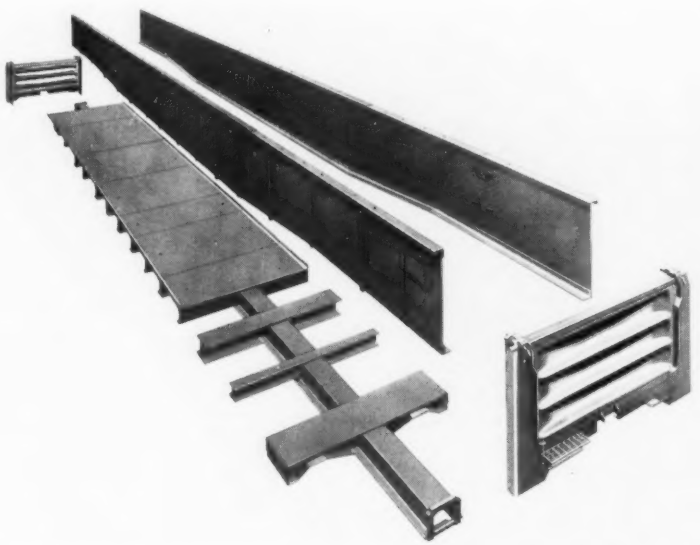
The sides are fishbelly design for maximum strength. The side sheets are $^1/_4$-in. steel plate, and can be furnished in heights to suit requirements. There are 16 side posts per car, of $^3/_8$-in. steel plate, located at the bolsters and crossbearers and with a wider section than conventional posts for increased support. In addition, there are 12 side posts of $^5/_{16}$-in. plate at the crossties.

Either drop ends or fixed ends are available. The drop ends are $^3/_8$-in. plate, with 4-in. deep corrugations. The corner posts are $^1/_2$-in. pressed plate.

There are 32 inside stake pockets per car, 1-in. diameter steel, hinged to fold down out of the way when not in use. Included also are 64 hold-down clips welded to the outside of the side sheets, all located to meet AAR requirements.



This 52-ft 6-in. PS-5 gondola and its longer mill-type companion have sides with inside height of 3-ft 6-in., but higher-side designs have been made.



Floor of the basic PS-5 is composed of steel plates assembled over the pressed-plate and I-beam crossties and over the six built-up arc-welded crossbearers.

	GENERAL DIMENSIONS	
	Basic 70-ton car	70-ton mill type
Length inside, ft-in.	52-6	65-6
Length over strikers, ft-in.	54-6	67-6
Length between trucks, ft-in.	43-6	56-6
Width inside, ft-in.	9-6	7-9
Height inside, ft-in.	3-6	3-6
Inside collapsible stake pockets	32	40
Hold-down clips	64	80
Drop ends	$^3/_8$-in. plate 4-in. corrugations	$^3/_8$-in. plate 4-in. corrugations

B&M 50-ton pulpwood cars feature all-welded underframes and bulkhead units. Bulkhead can either be riveted or welded in place

B & M Pulpwood Cars Use . . .

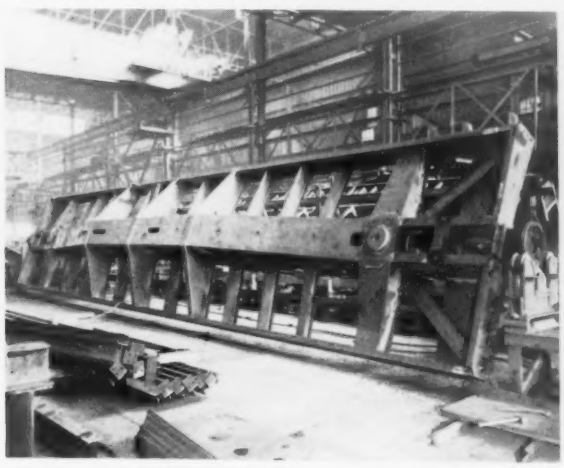
Prefabricated Welded Assemblies

The Boston & Maine has eighteen 50-ton pulp-wood cars, assembled at Concord, (N.H.) shops by B&M shop forces which have been in service 30 months. These cars utilize fabricated underframes and bulkhead components of all-welded construction.

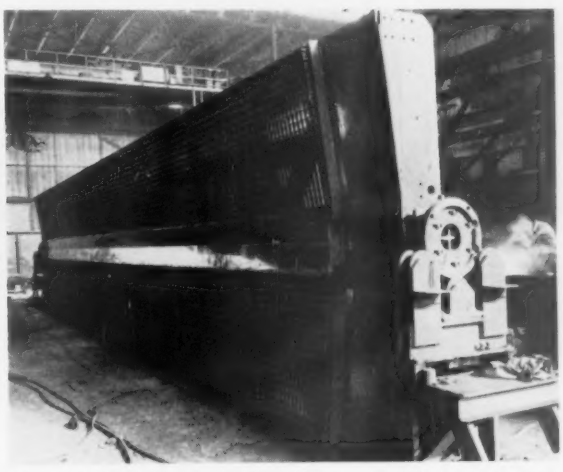
There were no written specifications for the job. The cars were designed by the Railway Division of International Steel Company, jointly with the mechanical department of the B&M and prospective shipper-users. All cars are B&M operated, and are used to haul hardwood billets from the forest to processing centers.

Due to the small number of cars on the order, there was no production line set-up, and no special welding jigs built. Underframes were made to close tolerances by simple welding fixtures to maintain necessary dimensions required of the assemblies.

The underframe was fabricated as a unit, with the center sill assembly constructed first, to which was added the crossbearers, bolsters, side sills, floor stringers and flooring. A fishbelly center sill was constructed of plate web and chords. The floor superstructure was made adequate to impact forces of pulp-billets dropped from a considerable height in "grapple" loading. Decking is low-alloy hightensile steel "grid" design sloped to center of car. Cross bearers and bolsters are built-up plate construction. The balance of the under-frames consists of



Underframe assembly with fishbelly center sill features built-up plate construction. Only castings used are strikers and integral center fillers.



Completed decking of grid design allows easy self-cleaning. Roller mounting of unit facilitates positioning for welding, speeds the assembly operation.

rolled shapes. Bulkhead units are fabricated from plates and formed shapes. All rolled shapes and plates are mild steel.

Both units were completely all-welded in the shop and shipped to the B&M for assembly. Strikers and center fillers are cast steel, with the center filler being an integral casting including center brace, rear draft lugs and body center plate.

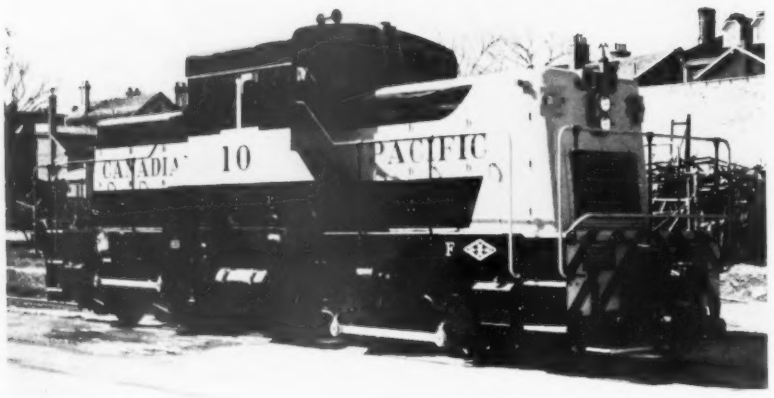
Trucks are 50-ton capacity and standard design. Safety appliances follow the ICC code, and were designed and assembled by the B&M.

The car measures 45 ft 9 in. between bulkheads, 9 ft 2½ in. over side sills and 8 ft 2½ in. from top of floor at side sill to top of bulkhead. Capacity is 22 cords, allowing a 6-in. extension of the bulkhead above the lading. The manufacturer of the unit assemblies finds that welded construction of rolled shapes and built-up sections reduces the amount of material used, and consequently the total cost is less.

B&M officials cite these cars as another instance of superior products resulting from objective collaboration of the user-carrier-designer and modern fabricator, also greater use railroads can make of their existing facilities in assembly of rolling stock from specialized component fabrications.

Diesel Hydraulics for Canadian Market

This 600-hp diesel hydraulic switcher was developed by General Motors Diesel Limited, London, Ont. and was displayed in Toronto for the first time late last year. The unit is an experimental prototype and is powered with two GM 6-110 diesel engines driving through Allison torque converters. Its reinforced plastic hood structure shows effects of Aerotrain styling.



Canadian Pacific recently received this 500-hp diesel hydraulic switcher from Canadian Locomotive Company, Kingston, Ont. It is powered with two Caterpillar D 377-F diesels each driving through a Twin Disc three-stage torque converter. Unit has side-rod drive, is 37-ft 8-in. over pulling faces, weighs 88,000 lb and has a top speed of 35 mph. Its fuel capacity is 400 gal.

HOW TO

Learn About Air Brakes

. . . AND HAVE FUN DOING IT

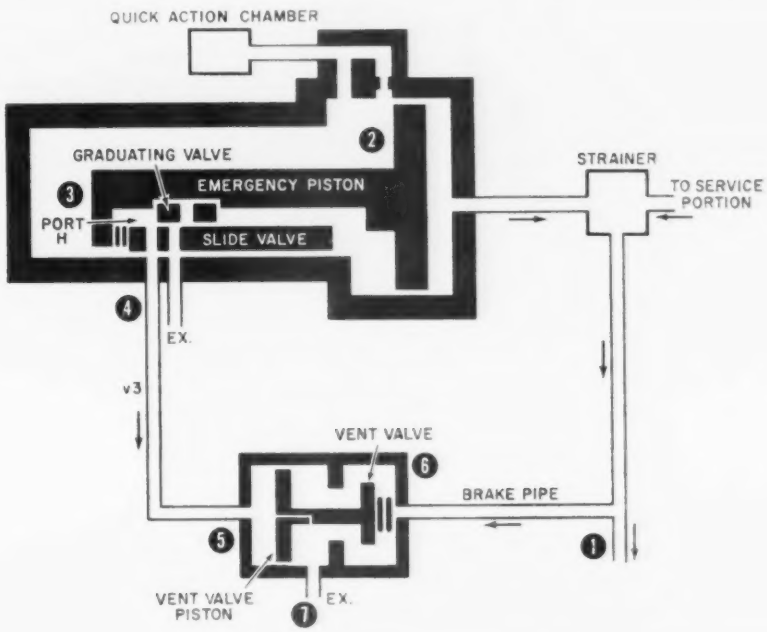
AB Car Equipment-Emergency Application

This is the third installment on the AB Equipment in the Air Brake in Color Schematics series. The first installment and the color chart appeared on page 87 of the November, 1956, issue, and the second on page 48 of the January, 1957, issue.

Starting First Stage Emergency—Sketch 12

When an emergency rate of brake pipe reduction takes place from any cause, quick action chamber air cannot flow through the vent port *v* in the graduating valve and connecting port in emergency slide valve to the atmosphere at the same rate. Sufficient differential is built up across the emergency piston to compress the emergency piston spring and allow the graduating valve to move far enough on the slide valve to uncover port *H* in the slide valve which registers with port *v3* in the seat. This allows quick action chamber air to flow to the left of the vent valve piston. This causes the vent valve to unseat, opening a large and direct passage from brake pipe to atmosphere by the vent protector.

With a heliotrope pencil, color the space at the left of the emergency piston, above the slide and graduating valves, into the quick action chamber and port, through passage *v3* into the chamber at the left of the vent valve piston. Show a light trickle of this color through the small port in the vent valve piston leading to the Exhaust. Dampen the parts colored and let dry before proceeding further. With a yellow pencil, color the space at the right of emergency piston, continue in the passage to and through the strainer, through the passage to the vent valve and color the space at the right of vent valve piston and to Exhaust. Dampen the color and let dry.



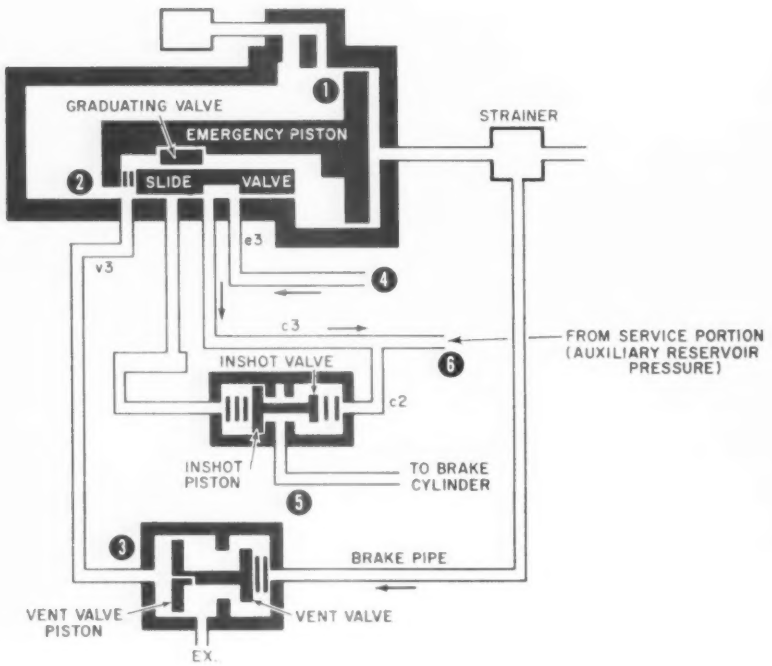
Sketch 12
Emergency Portion
Start of Emergency, First Stage

1. Emergency Rate of Brake Pipe reduction takes place.
2. Emergency Piston moves right.
3. Graduating Valve uncovers port H in the slide valve.
4. Port H connects with v3 in the seat.
5. Quick Action Chamber is now connected to chamber at left of Vent Valve Piston.
6. Piston moves to right, unseating Vent Valve.
7. Brake Pipe air flows past Vent Valve to atmosphere.

Completion of First Stage Emergency—Sketch 13

The rapid reduction of brake pipe pressure causes the emergency piston to move to the extreme right taking the slide valve with it. Slide valve port *H* is now out of register with seat port *v3* but this port is now uncovered by the slide valve so that the quick action chamber remains connected to the vent valve piston chamber. The emergency slide valve now connects ports for emergency reservoir air to flow from passage *e3* through slide valve cavity *K* to passage *c6*. It then flows through passages *c3* and *c2* into the inshot valve chamber. The emergency slide valve has blanked port *c7* leading to the inshot volume and the spring side of the inshot piston. The inshot piston spring holds the inshot valve open to allow air to flow at an unrestricted rate to the brake cylinder until approximately 15 psi. brake cylinder pressure has developed when the force of the inshot piston spring is overcome and piston moves to left, allowing the inshot valve to close.

Color with heliotrope and yellow similar to that done on preceding sketch. Dampen each color as completed and let dry before proceeding with the next color. With an orange pencil, color passage *e3* including the cavity in emergency slide valve but stop at the point where the left end of the cavity touches the slide valve seat. At this point and with a pink pencil color passages *c3* and *c2*. Continue into the inshot portion at the right of inshot piston and passage to brake cylinder. Dampen and dry.



Sketch 13
Emergency, First Stage

1. Due to rapid reduction of brake pipe pressure, emergency piston and slide valve move to the extreme right.
2. Port v3 is uncovered by the slide valve.
3. Quick Action Chamber remains connected to the left side of vent valve piston.
4. Emergency Reservoir air connected from e3 through cavity in slide valve to passages c3 and c2 to the Inshot Valve chamber.
5. Past open Inshot Valve to brake cylinder passage.
6. Brake cylinder passages also supplied from the service portion (not shown).

Emergency, Second Stage—Sketch 14

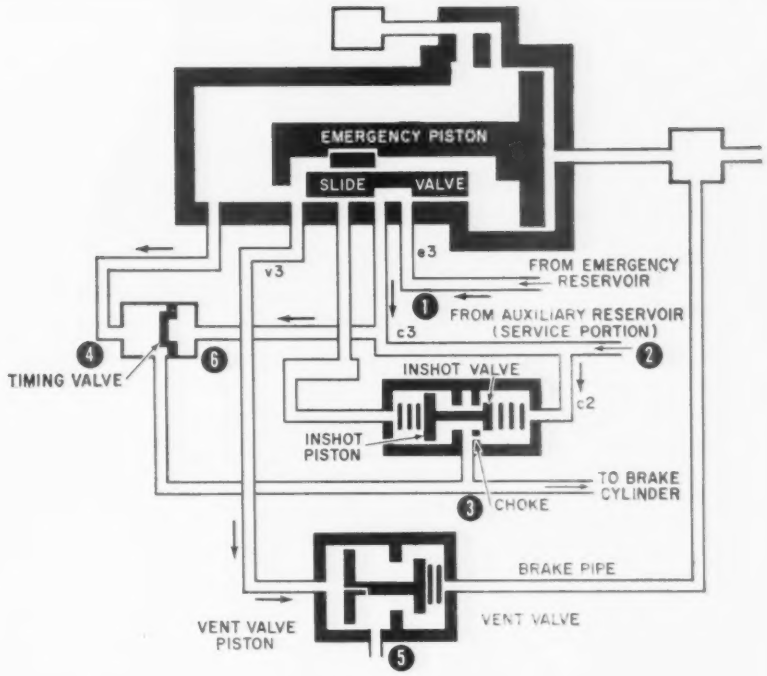
With the inshot valve now closed, brake cylinder build-up continues at a slower rate through the delay choke *127*. The duration of this delayed build-up of brake cylinder pressure is continued until the timing valve is unseated by the increasing brake cylinder pressure.

With a heliotrope pencil fill in the quick-action chamber, the space at the left of emergency piston, and the passage to and including the space at the left of the closed timing valve. Color passage *v3* and the space at the left of the vent valve piston, continuing through the vent valve piston port to the Exhaust. Dampen with a small brush and let dry. With the orange pencil color passage *e3* and the slide valve cavity to the slide valve seat. Dampen and let dry.

From the slide valve seat, color in pink passages *c3* and *c2* to the inshot valve. In the inshot valve, color to the right face of the inshot piston, out of the inshot valve to the brake cylinder and back to the outside face of the timing valve. Also color in pink the passage connecting the timing valve to passage *c3*. Brake pipe pressure has by this time been depleted. However, color the brake pipe from the right face of the emergency piston to the vent valve in yellow *dashes*. Dampen and let dry.

Sketch 14
Emergency, Second Stage

1. Emergency Reservoir pressure to brake cylinder via e3 and c3.
2. Auxiliary Reservoir pressure (from service portion not shown) to brake cylinder passages.
3. Inshot Valve now closed. Brake cylinder supplied through choke.
4. Quick Action Chamber air on left side of Timing Valve.
5. Quick Action Chamber pressure reducing through port in vent valve piston to atmosphere.
6. Brake Cylinder pressure building up on right side of Timing Valve.



Emergency, Third Stage—Sketch 15

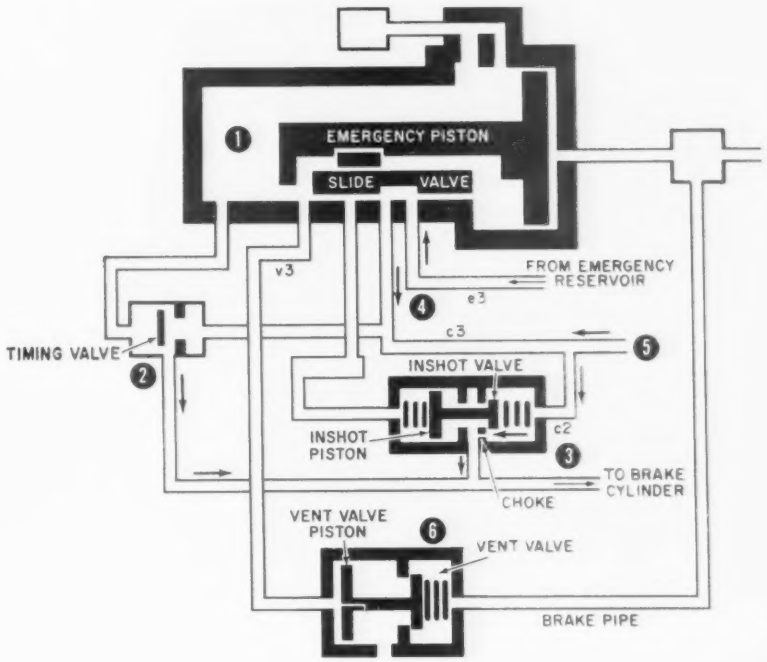
Brake cylinder pressure on the right side of the timing valve is increasing while quick-action chamber pressure on the opposite face of the valve is reducing. When the latter pressure has reduced to a certain relation to that of the brake cylinder, the timing valve will be unseated. Air can then flow to the brake cylinder through choke *153* in addition to flowing through choke *127* in the inshot valve, producing a faster rate of final brake cylinder build-up. The vent valve will remain open approximately 60 to 70 seconds at which time quick-action chamber pressure has been reduced sufficiently to permit the vent valve spring to seat the valve.

With heliotrope, in *dashes*, fill in the space at the left of emergency

Continued on next page

Sketch 15
Emergency, Third Stage

1. Quick Action Chamber Air has reduced to approximately zero.
2. Timing Valve opened by brake cylinder pressure, permitting flow of air to brake cylinder.
3. Brake cylinder also supplied through choke in inshot portion.
4. Emergency Reservoir pressure connected to brake cylinder passage.
5. Auxiliary Reservoir pressure connected to brake cylinder passage (from Service Portion).
6. Vent Valve closed by its spring, shutting off connection from brake pipe to atmosphere.



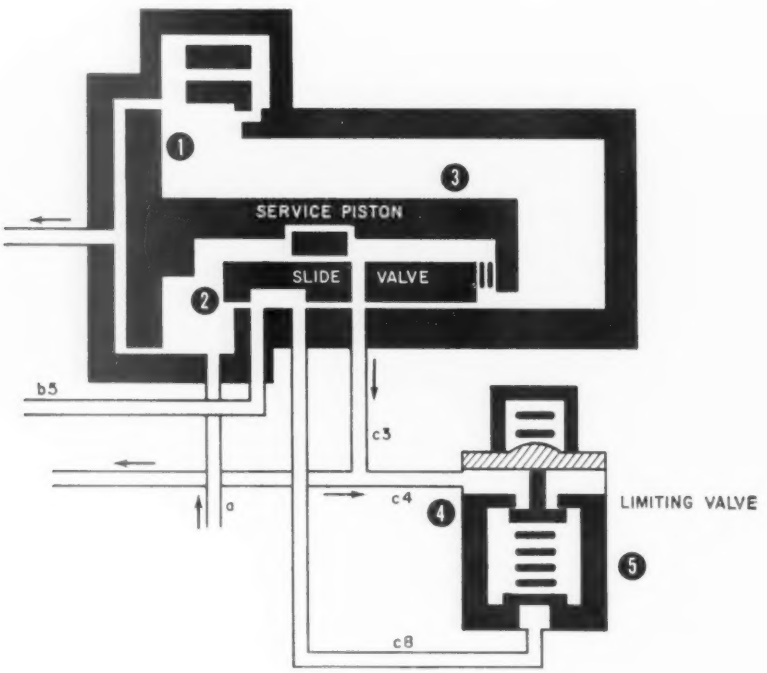
Continued from preceding page
piston, quick-action chamber and passages to the timing valve and to the vent valve. Dampen and let dry. With an orange pencil color passage *e3* and slide valve cavity as in previous sketch. After the color has been dampened and dried, continue in pink from the slide valve seat through passages *c3* and *c2* to the inshot valve, through the valve chamber, through the choke to the brake cylinder and the passage from *c3* to and through the timing valve and the passage connecting to the brake cylinder passage. Dampen and let dry. With a yellow pencil, color in *dashes* the brake pipe connections as in previous sketch. Dampen and let dry.

Service Portion Operation During Emergency—Sketch 16

The reduction in brake pipe pressure has caused the service piston and slide valve to move to the extreme left position where the graduating valve uncovers the service port *c5*. The slide valve connects *c5* for auxiliary reservoir air to flow through passage *c3* to passage *c2* combining with the flow from the emergency reservoir.

With a dark green pencil, color the space at the right of the service piston, above slide and graduating valves and out through passage *a* to the auxiliary reservoir. Do not carry the green color into passage *c3*. Make the green end at the upper face of the slide valve at the point where port *c3* is uncovered by the graduating valve (G.V.). Dampen the color and let dry. With a pink pencil and starting at the top of service slide valve (where the green left off) fill in passages *c3* and *c4*. Carry the color into the Quick Service Limiting Valve.

Inasmuch as brake pipe pressure is now lower than that of the brake cylinder, the latter pressure (shown in pink) will unseat the upper check valve and hold the lower valve closed. Dampen and let dry. With a yellow pencil, fill in by *dashes* the small space at the left of the service piston and the passage leading from it. Also color brake pipe passage *b5* (in dashes) through the cavity in service slide valve and passage *c8* to the under face of lower quick service limiting valve check valve. Dampen and let dry.



Sketch 16
Service Portion Operation During Emergency

1. Service piston moves to extreme left position.
2. Slide Valve (S.V.) connects brake pipe passage b5 to c8 to Limiting Valve.
3. Auxiliary Reservoir air past graduating valve to brake cylinder passage c3.
4. Brake cylinder air, c3 to c4 to Limiting Valve, under diaphragm.
5. Brake Cylinder pressure charges into the space between the upper and lower limiting valve check valves.

8,500-Hp Locomotive Power Plants

A thermal efficiency of 20 per cent and greatly reduced number of components are features of the new Union Pacific gas-turbine-electric locomotives, the first of which is about ready for delivery

By R. M. Smith, Locomotive & Car Equipment Department and A. N. Smith, Gas Turbine Department, General Electric Company

THE FLEET OF 25 GAS turbine-electric locomotives in operation on the Union Pacific has accumulated 10 million miles of operation since the first unit was delivered to the railroad by the General Electric Company in January 1952. To date, this fleet has accumulated more than 10 million miles in mainline freight service, and has demonstrated its ability to haul trains approximately 20 per cent faster than other forms of motive power.

The successful performance of the 4,500-hp gas turbine-electric locomotives, coupled with the desire for higher speed freight transportation to meet increasing competition, led to the design of a new, larger locomotive. This is a 2-unit locomotive, rated 8,500-hp for traction at 6,000 ft elevation and 90 deg F ambient.

Locomotive service is a rugged application for equipment involving almost every conceivable condition ambient. The various devices operate on a moving, twisting, and deflecting platform with possible high impact loadings. Reliability with a minimum or periodic checks, maintenance and servicing is required. In practce the equipment operates nearly as an unattended station with load demands varying over the complete range of capabilities for rather short periods of time at a particular condition.

Operating experience with the 4,500-hp locomotives in this sort of application has pointed up numerous design improvements. These have been applied to the new 8,500-hp locomotives to give higher efficiency, increased reliability and reduced maintenance.

General Description

The complete locomotive consists of three parts: the auixliary power unit, the main power unit, and the fuel tender. The wheel arrangement is 2 (C-C) and the weight exclusive of the fuel tender is 816,000 lb. The two power units, coupled together, have an overall length of 132 ft

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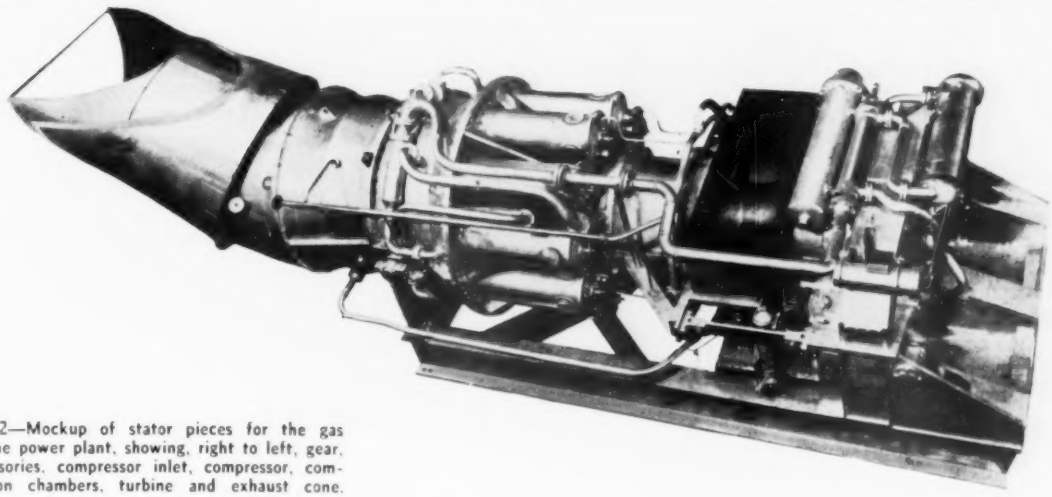


Fig. 2—Mockup of stator pieces for the gas turbine power plant, showing, right to left, gear, accessories, compressor inlet, compressor, combustion chambers, turbine and exhaust cone.

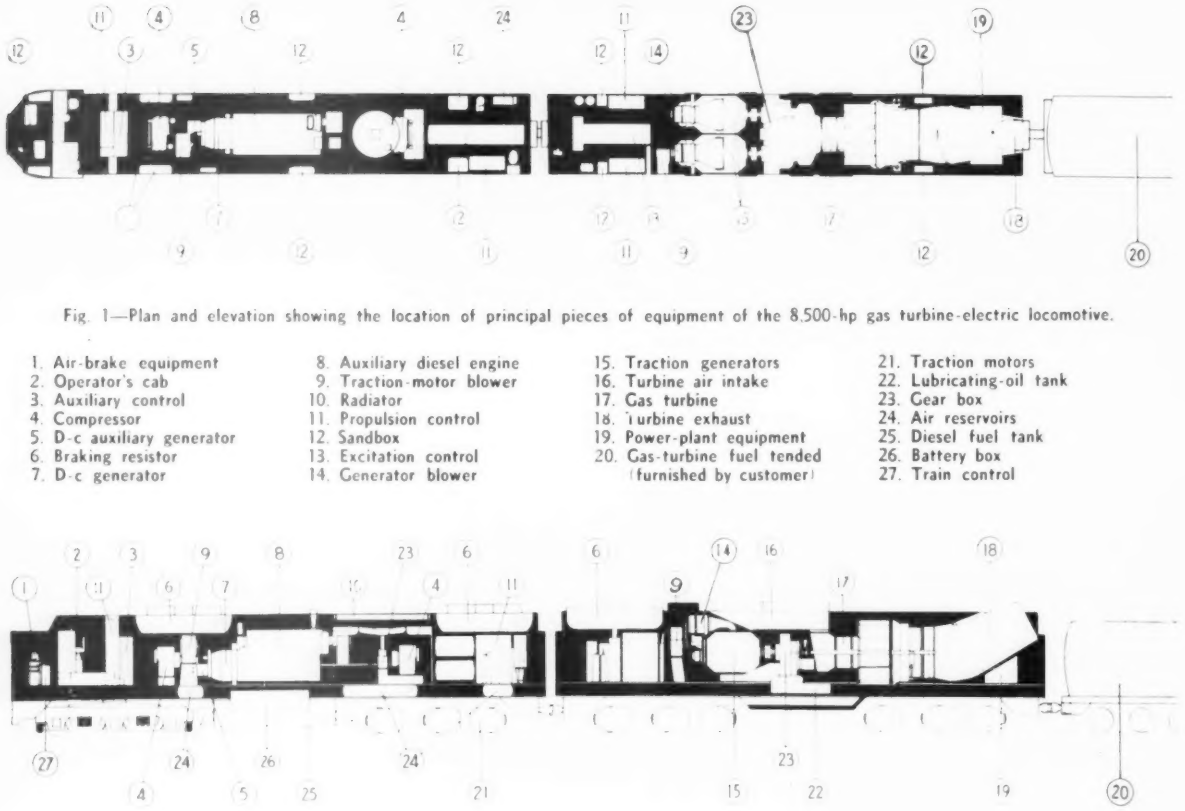


Fig. 1—Plan and elevation showing the location of principal pieces of equipment of the 8,500-hp gas turbine-electric locomotive.

1. Air-brake equipment
2. Operator's cab
3. Auxiliary control
4. Compressor
5. D-c auxiliary generator
6. Braking resistor
7. D-c generator
8. Auxiliary diesel engine
9. Traction-motor blower
10. Radiator
11. Propulsion control
12. Sandbox
13. Excitation control
14. Generator blower
15. Traction generators
16. Turbine air intake
17. Gas turbine
18. Turbine exhaust
19. Power-plant equipment
20. Gas-turbine fuel tended (furnished by customer)
21. Traction motors
22. Lubricating-oil tank
23. Gear box
24. Air reservoirs
25. Diesel fuel tank
26. Battery box
27. Train control

6 in. The cab of each unit is carried on two three-axle trucks, with all axles motored. Design of the cab structure closely follows that commonly used on diesel-electric locomotives, although the section comprising the entire length of the turbine and generators is removable for maintenance purposes.

The auxiliary power unit contains the engineman's cab and an auxiliary diesel engine, and is capable of independent operation for light movements. This six-cylinder diesel engine suppiles power for the turbine accessories and other auxiliaries, and operates continuously while the locomotive is in service. It also drives the two air brake compressors.

The gas-turbine power plant and associated equipment is contained in the second unit of the locomotive. This cab is not capable of operating unless coupled to the leading, or auxiliary power, unit. An air-driven controller was developed for turbine starting on the new locomotives. This substitutes mechanical interlocking in the form of cams for the electrical interlocking previously used, and greatly simplifies this control function.

Four traction generators are mounted, two per set, in a back-to-back arrangement with bearings at the commutator ends only. Unusual precautions have been taken to insure a supply of clean ventilating air for the generators. Each generator set is fitted with its own gear-driven air-cleaning type blower. Air from the blower is delivered to the center of the generator set, where it divides to the two machines, passing first over the rear end windings, then over the exciting field coils and armature, and finally from the commutator end of the machine.

Each generator supplies power to the three traction motors on one truck. These are connected permanently in parallel and have one step of field shunting. Each group of motors with its associated control equipment, excitation equipment, and generator is completely isolated from the others and can be cut out without affecting the remaining three groups. The traction motors are the standard GE-752 model, series-wound, 4-pole design widely used in diesel-electric, gas turbine-electric and rectifier-type electric locomotives. They are geared with a 74/18 ratio to axles mounting 40-in. wheels, giving the locomotives a maximum speed of 65-mph, and a continuous tractive force of 145,600 at 18-mph. For starting trains, the locomotive is capacle of developing 204,000 lb. tractive force, corresponding to 25 per cent adhesion.

All Bunker C fuel is carried in a tender designed and built by the railway. Fuel is pumped into the tender at an average temperature of approximately 180 deg F. Chief reliance for keeping the fuel warm is placed on the insulation of the tender tank, consisting of four in. of resin-bound glass wool. In addition, supplementary heat is provided by electric heaters supplied with power from the diesel-driven auxiliary generator, and by recirculating fuel that has been heated from the atomizing air supply. Steam lines are available for emergency wayside heating.

Cooling for the diesel engine

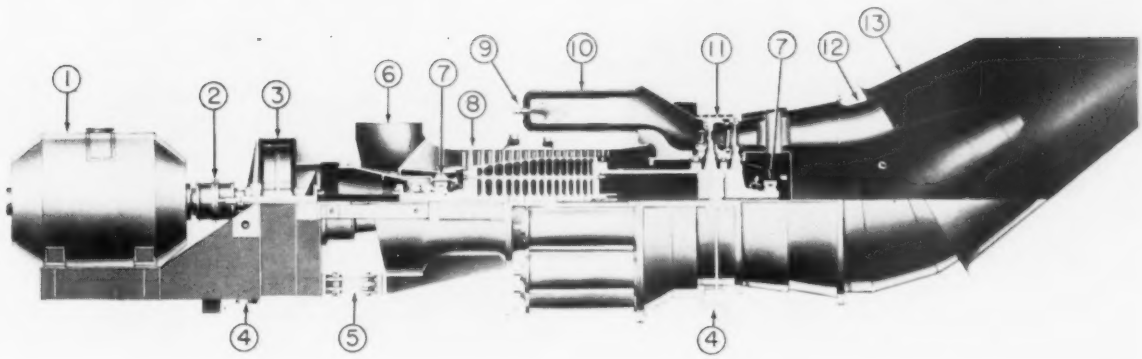


Fig. 3—Cross-section of the power plant. Note that the generators are mounted on the gear platform.

1. Traction generator
2. Generator coupling
3. Gear box
4. Support strut
5. Connecting link
6. Air inlet
7. Main Bearings
8. Axial flow compressor
9. Fuel nozzle
10. Combustion chamber
11. Two-stage turbine
12. Eductor
13. Tail Cone

jacket water and the turbine lubricating oil is provided by a conventional water-to-air radiator located in the auxiliary unit. The water systems for the turbine and diesel engine are kept entirely separate. Both sections of the radiator are cooled by a single fan, driven from the diesel engine shaft through an eddy-current clutch and right-angle gear box. Temperatures of the two systems are modulated by by-pass valves in each system.

Two air brake compressors are provided;—one driven from the gear box that also drives the radiator fan, and the other from a shaft extension on the generator at the forward end of the diesel engine. Both compressors are equipped with a disconnect feature so that they can be disconnected from the engine in case of failure.

Dynamic braking, using standard dieselectric locomotive circuits and components and designed for a peak braking effort of 147,000 lb, at 22 mph, is provided. Traction motor field excitation is supplied from the diesel-driven generator. Braking controls are self-regulating to preclude overloading the braking resistors or traction motor fields.

While the horsepower per axle is higher than on previous locomotives, definite steps have been taken to maintain good adhesion. Since all main fuel is carried in the tender, the axle loading is practically constant. The truck design and arrangement give less weight shifting than on previous locomotives. The sand capacity has been increased. A comprehensive wheel-slip equipment, which measures the speed of each axle and detect slips with equal sensitivity over the entire locomotive speed and power range, is used. The traction motors are permanently connected in parallel, thus preventing high acceleration rates on a slipping wheel.

Controls of the new locomotive are largely duplicates of those on the 4,500-hp locomotives. The same 20-notch throttle is used. Turbine starting is accomplished simply by pressing a button on the engineman's control panel. Once this button is depressed, the turbine starting sequence automatically follows through the complete cycle lasting approximately nine minutes. Completion of the cycle is indicated at the engineman's position.

The Notching Guide meter that was found of value on the existing locomotives has been retained in the new design. Otherwise, from the engineman's point of view, there is practically no difference between this locomotive and the standard diesel-electric.

8,500-Hp Gas Turbine Power Plant

This gas turbine design has evolved out of the more than a million and a half accumulated hours of operating experience with General Electric gas turbines, the locomotive experience, and the need for more than doubling the previous locomotives.

The traction generators are driven through reduction gearing from the compressor inlet end of the gas turbine. The compressor and turbine rotors are close coupled. This has been made possible by folding the combustion chambers back over the compressor. The overall length is 41 ft, and the total weight is 150,000 lb, including 47,000 lb of traction generators. The turbine speed of 4,870-rpm is reduced to 1,050-rpm for the generators by a double helical gear. This gear casing is extended to provide a platform for mounting the traction generators.

The gear-generator unit and the gas turbine are interconnected and mounted in the cab with a double three-point support arrangement. This permits relative twist between the parts while holding alignment. Two flexible legs and a key attach the turbine to the cab platform, and two flexible legs attach the gear-generator unit to the platform. A buff pin in the plane of the gear flex-legs projects into the cab platform and transmits the axial braking and coupling forces from the power plant to the platform.

The 570,000 lb per hour of air for the gas turbine is taken in at cab roof level through a duct and silencer arrangement. Entering the compressor inlet hood, the air passes through the 16-stage, axial-flow compressor where it is compressed at 95 psi, and its temperature increased to 525 deg F. From the compressor discharge, the air makes a 180-deg turn into the 10 reverse-flow

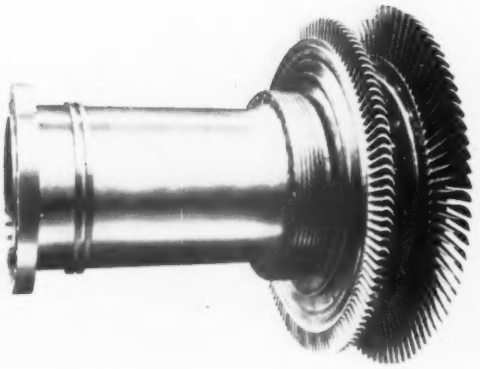


Fig. 4—Assembled 16-stage axial-flow compressor rotor.

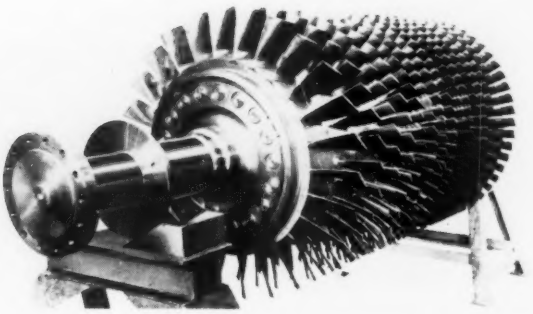


Fig. 5—Turbine rotor for the 8,500-hp locomotive, with compressor-to-turbine distance piece at left.

combustion chambers. While traveling up the combustion annulus, it enters the liner as combustion air and cooling air. The resulting hot gases, up to 1,450 deg F, flow through transition pieces into the first-stage nozzle of the turbine. Expansion through the turbine results in exhaust gases flowing through the exhaust cone at essentially ambient pressure, and at temperatures up to 825 deg F. A. thermal efficiency of 20 per cent based on the lower heating value of the fuel is expected at full load.

The compressor rotor is a stack-up of individual bladed wheels rabbeted and bolted together. The two turbine wheels are flanged and bolted together. A large diameter distance piece connects the compressor and turbine rotors. Single lock axial entry dovetails are used for the compressor blade attachment. The turbine buckets use an axial entry fir-tree type dovetail. A shank of 1.3 in. is included in the first stage bucket platform to reduce the temperature at the dovetail.

The air inlet hood passages provided for air flow from a rectangular duct flanged to an annular entrance to the compressor. The compressor casings from a cylindrical containing member for the air of a compressor. Fourth-stage and tenth-stage extractions are made to supply cooling air for the turbine stator and turbine wheels. The compressor discharge includes a large diameter bulkhead to which the outer combustion chambers are attached. An inner barrel of this discharge covers the rotor distance piece, and extends to form an inner support of the first-stage nozzle. This member is ribbed to the rest of the discharge casing.

ITEMS REQUIRING MAINTENANCE

Item	5 Diesel Units (8,750-hp)	Present Gas Turbine (4,500-hp)	New Gas Turbine (8,500-hp)
Traction motors and generators	25	12	16
Auxiliary machines	40	32	15
Relays	110	52	24
Contactors	70	54	57
Reversers and braking switches	10	4	8

The 10 outer combustion chambers have a bolted connection to the bulkhead of the discharge casing. A V-type clamp holds an end cover on this outer chamber. Fuel nozzles attach at the center of this end cover, and extend into the cap of the combustion liner. This liner cap is supported from the end cover and the one-piece, louver-type liner extends from the cap to the cylindrical portion of the transition piece. Pads are provided on the outer chambers for spark plugs, flame detectors and cross-fire tubes.

The turbine shell continues the stator structure from the bulkhead back over the second-stage buckets. Grooves are provided for the hooks of the first-stage and second-stage shroud members. The first-stage nozzle is centerline supported from the shell, and its axial load is taken in a groove of the turbine shell. Two cylindrical members, ribbed together, form the structure of the exhaust hood. Within these members, a diffusing gas path is provided and metal boots protect the structural ribs from the exhaust gases. An exhaust tailcone directs the gases out of the roof at the rear of the cab.

Both of the turbine nozzles are of welded-in partition construction. The half rings are mechanically held together. Provision is made for the thermal growth of the nozzles with centerline supporting. A diaphragm is supported from the second-stage nozzle to seal between the two turbine stages.

The two journal bearings are of the thin-wall babbit type. A tilting-shoe active thrust bearing and a plate-type inactive thrust bearing aore used. Both bearing housings are centerline supported, one in the inlet hood and one in the exhaust hood structure. The bearings are in low-pressure regions of the machine and the drain spaces are kept at a partial vacuum by means of a vapor extractor.

Compressor discharge air cools the first-stage nozzle partitions. Leakage through the high-presure packing cools the inlet side of the first-stage wheel. Tenth-stage extraction cools the aft side of the first-stage wheel, and forward side of the second-stage wheel. The nozzle and wheel cooling air returns to the gas

(Continued on Page 78)

Insulating Varnishes Are Vital to Good Locomotive Performance

Proper selection and correct application of insulating varnishes are essential to long life of motor and generator insulation

WITH THE RETIREMENT OF STEAM locomotives on many major railroads a very near reality, roundhouse hostlers, locomotive crews and particularly main shop crews have had to absorb elements of electricity to keep locomotives in service. As a consequence the term "varnish" has ceased to be a description of passenger rolling stock and come to mean the resinous material vital to continued performance of diesel-electric generators and traction motors.

The importance of insulating varnishes in both generator and traction motors is often treated with a great deal more lightheartedness than it should be. The difference between reliable performance and failure at the heart of modern railroad motive power hinges on how well the impregnating varnish does its job. Since varnishes represent the pivot point for locomotive performance, the function, application problems and results expected deserve careful consideration by anyone responsible for diesel-electric maintenance and repair.

Why Are Varnishes Used?

Insulating varnishes are used to impregnate the windings of both generators and traction motors in the modern diesel-electric locomotive. The coating deposited upon the windings is expected to improve the dielectric strength of the glass cloth and mica insulation, protect the windings from abrasive dust drawn over them by the air circulating through the windings, present a barrier to moisture and oil encountered in operation, secure the wires in position relative to one another in the windings in spite of vibration, thermal creepage and torque.

In spite of the mechanical functions insulating varnishes are called upon to fulfill, the most important property by far is the dielectric strength of the film deposited by the cured varnish. The impregnating varnish is used to backstop the other motor or generator insulation during periods of overloading and voltage surges, particularly at the transition points.

In addition to a dielectric strength sufficient to allow a margin of safety at the 960-volt surges during transition, the varnish must be capable of providing a water-tight seal around the surface to both field and armature windings to prevent shorting. Besides forming a waterproof seal, the varnish used by a railroad must form a film that is physically tough, resistant to abrasion, acids, chemicals, and heat. Also, it must have enough adhesion and cohesion to prevent wires from shifting positions, causing wear on the magnet wire insulation and eventual breakdown.

Which Varnish to Use?

When considering a varnish for use in a locomotive, the considerations above must be checked against the properties of the varnish being evaluated . Generally speaking, the natural phenolic resins incorporated into a thermo-setting or cross-linking varnish will provide the optimum varnish for railway applications. In spite of the fact that some original manufacturers of railway generators and traction motors use silicone varnishes in the original insulation system, many repair shop experts feel that the natural phenolic varnishes possess better stability and exhibit superior mechanical properties.

The thermosetting property is essential for critical applications such as most railroads encounter. The varnish must be able to penetrate the many nooks and crevices between windings and between the individual wires within the windings. Then it must have the ability to cure completely in such out-of-the-way corners without the presence of oxygen—hence the use of cross-linking varnishes which set up under heat.

A varnish having the ideal properties for railway application should have a phenol aldehyde resin base, a dielectric strength of 1,800 to 2,500 volts per mil when dry, excellent oil, water, acid and alkali resistance, and extreme toughness of film both as to cohesion and abrasion.

How Should Varnish Be Applied?

Once the proper varnish has been chosen, the problem remains of getting onto and into the equipment in the manner that will permit maximum use of its properties.

Many methods exist for applying varnish, ranging from brushing it on to coils with a paint brush, spraying, dipping in large tanks, to custom-made impregnators designed specifically for railroad equipment.

An excellent example of custom-made equipment for impregnating generator field windings and traction motor frames can be found in the Great Northern railroad's main shops in St. Paul, Minn. This is described in an article which appears on page 58 of this issue.

This method allows for thorough impregnation of field windings and eliminates the mess of cleaning up the frame, a necessary step when the frames are dipped. When the impregnation cycle is complete, the varnish is simply drained back into the reservoir tank and the frame is moved to the baking oven where it is given an eight-hour bake at 290 deg F.

Several interesting refinements are built into the Great Northern's impregnator. One is a filter system

This article was prepared by J. J. Zaleski, Sales Engineer, Irvington Division, Minnesota Mining and Manufacturing Company.

linked to the pumping system which allows all the varnish in the reservoir tank to be pumped through the filter to remove all foreign material that might contaminate the varnish.

Whatever system is used to impregnate field windings, care must be taken to remove all the air from the unit and replace it with varnish. In the case of the impregnator, this is done by holding the varnish in place for a period of time to give trapped air a chance to rise to the surface of the varnish in the form of bubbles. When varnishes are brushed or sprayed onto the surface of the windings, the removal of air is less a problem but getting the necessary degree of impregnation becomes a considerable factor. One solution sometimes used is predipping the coils before they are bolted in place in the frame and then painting or spraying the interior of the frame with a moisture barrier coat.

Nearly all armatures are impregnated by dipping them directly into varnish. Frequently this dipping operation is done in special tanks equipped with vacuum pumps which are capable of vacuum-impregnating the dipped units. Many of these vacuum tanks are also equipped with pressure systems which apply a gaseous pressure to the varnish after the vacuum has been released.

The Great Northern shops use a vacuum impregnation cycle followed by a pressure cycle of 40 psi, using CO_2 under pressure for the final cycle. The advantage of CO_2 as a pressure gas is in the fire damping ability of gaseous carbon dioxide.

Precautions Are Necessary

Once the correct varnish and method of applying it have been found, certain precautions must be exercised to assure the continued high performance of the varnish.

All units, either frames or armatures, which come in contact with the varnish should be thoroughly cleaned first to remove all dirt, grease, carbon and insulation shreds that might contaminate the varnish. Such contamination could lead to livering or jelling of the varnish, sharp drops in dielectric strength and incomplete impregnation.

One of the best methods of cleaning equipment prior to dipping is with a vapor degreasing apparatus. Those which use trichloroethylene as the cleansing solvent are judged to be best since the boiling point of this chemical is higher than that of water—which assures the operator that the vapor will boil all moisture from the unit being cleaned.

Even after the units have been cleaned, best results and trouble-free operation are further guaranteed by using some sort of filter system to remove all foreign matter from the varnish in the tank. Many filtering systems are available using either mechanical filters, screens or diatomaceous earth patties as the element to remove solids from the liquid varnish.

Frequent checks on the viscosity of the varnish will result in more uniform coating, standardized curing with the same baking time and will prevent wet spots in the varnish interior which might result in throw-out during operation.

Of equal importance with the thickness of the varnish coat and the degree of impregnation is the completeness of the cure effected by the baking cycle. Close work with the varnish manufacturer in deciding upon the best period of baking necessary for a complete cure is the safest method of assuring a complete thermosetting of all the varnish in a frame or armature. Frequently the cure time recommended by manufacturers on labels and other printed matter does not take into account the time necessary to bring the large masses of metal involved in heavy traction equipment up to the proper curing temperature.

All possible preventative measures should be taken to prevent fire explosions when working with large quantities of varnish. Most varnishes of the type suitable for railroad use contain extremely volatile solvents which are highly inflammable. Precautions against smoking, welding, static electricity and other sources of open flame or sparks should be carefully observed.

With the proper care exercised in choosing the varnish, the methods of application and in quality control of the varnish—trouble-free, long operational periods are much more likely.

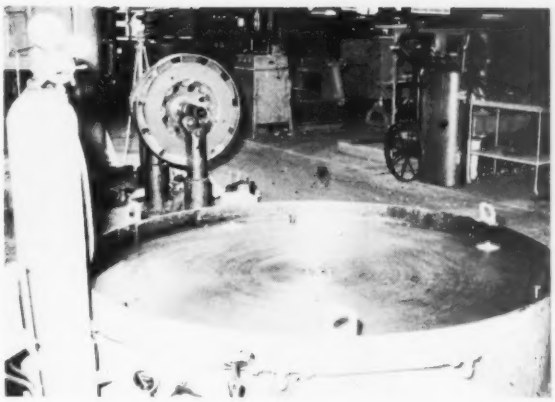
Field Frame Impregnator

All sizes and makes of generators and motors are varnished by filling on the same machine

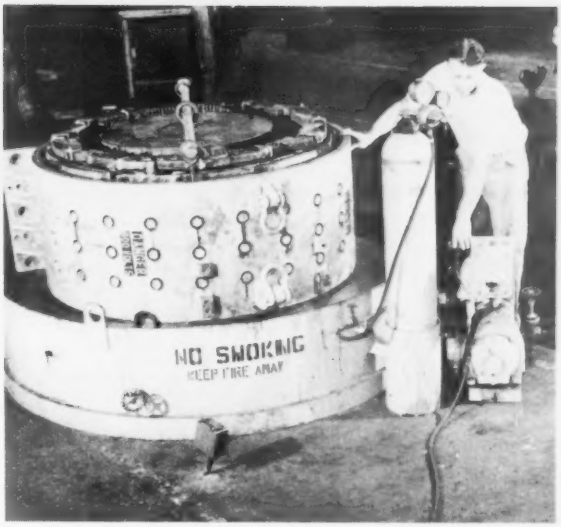
The Great Northern makes a practice of varnishing all overhauled generator and motor field frames by laying them on their side and filling them with varnish. The method has been used on motors for several years at the railroad's Dale Street Shops in St. Paul, Minn., and the practice has almost eliminated grounded fields and has not decreased motor thermal capacity.

The tank shown in the illustrations hold 250 gal of varnish and the machine plate which forms the top of the tank is 80 in. in diameter. The frame to be filled is laid on its side on the machined plate and the motor-driven pump forces varnish from the tank up through the hole in the center of the tank. To avoid pumping an unnecessarily large amount of varnish, a displacement tank is used to fill the space normally taken by the armature of generators. Only one tank is used. It is just small enough to fit the space in a D-4 generator and it occupies most of the space in larger generators.

Types D-8 and D-4 generators are laid directly on the plate. The fit is sufficiently tight to allow very little seepage under the edge of the frame when the frame is full. D-12 generators have coils extending beyond the edge of the frame. This situation is taken care of by a machined ring of the same diameter as the frame and which is secured to

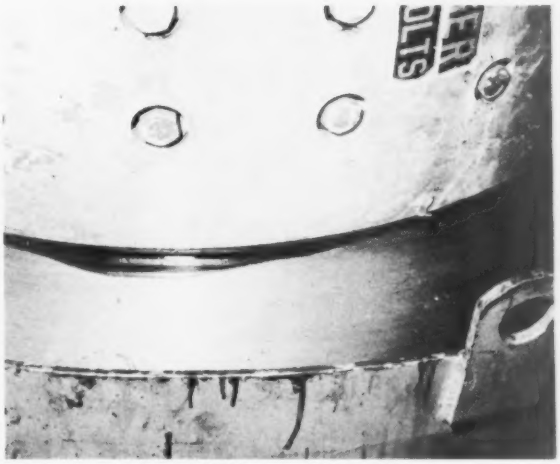


The 80-in. machined plate on which frames are varnished is kept clean between operations with Xylol.



The operator starts the filling operation. The operating handle of the dump valve may be seen at the front of the tank. ►

The 1-hp pump is used for lifting varnish into the frames and for mixing thinner and varnish.



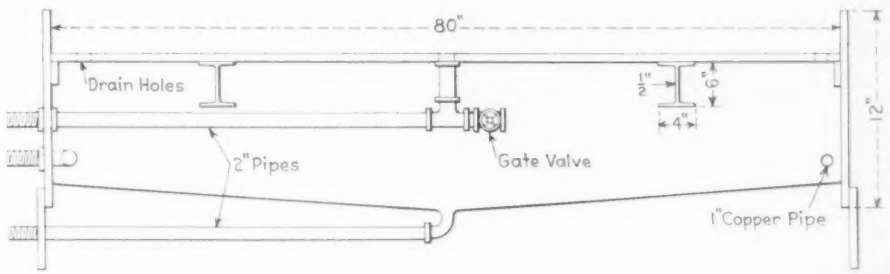
When a frame is full only a small amount of varnish seeps out under the edge of the frame.

the lower edge of the frame by screwing four plug screws into the frame holes. There are four corresponding holes in the ring. The ring holes are countersunk, and four flat head screws are placed in the ring holes and screwed into the inner threads of the plug screws in the frame.

When a D-12 generator is lying on the plate, the compensating coils protrude above the edge of the frame and cannot be insulated by filling. Varnish is brushed on to these coils.

Motors to be varnished are placed on the plate with the commutator end down. Neoprene foam rubber rings are used as a seal between the motor and the plate. Spring cover plates with corresponding Neoprene rubber gaskets are used to seal the commutator cover plate holes and the air openings. The lead openings and other holes are plugged with Duxseal.

With a frame in place, the one-horsepower motor-driven pump is used to draw varnish from the bottom center of the tank, out through



Section of the tank showing piping for filling, draining and mixing varnish.

the hole in the center of the machined plate. The largest frame can be filled in two minutes. When the frame is full, the varnish is allowed to stand for 15 to 20 minutes. It is then drained back into the tank through the dump valve just below and at one side of the center opening.

After the frame is removed from the plate, the excess varnish on the plate is squeezed to four holes near the edge of the plate and the plate is then wiped clean with Xylol cleaner.

To compensate for evaporation, thinner is added periodically, and thinner and varnish are mixed thoroughly by pumping from the center drain at the bottom of the tank into an annular ring of copper pipe which extends around the inside of the tank near the bottom. There are small holes in the inner side of the ring and the varnish is ejected toward the center of the tank.

The varnish is also filtered at intervals. This is accomplished by placing a filter over the center hole in the plate, pumping varnish through the filter and allowing it to drain back into the tank.

CO_2 gas is used to blanket the surface of the varnish in the tank and thus reduce the fire hazard. The gas is introduced in three places to insure coverage, since the tank is divided into three spaces by the two eye beams which support the plate.

How Much Do You Know About Brushes

How Does Brush Friction Affect Brush Performance?

USUALLY, WE LIKE to be able to define the property we are discussing but in the case of friction, it must be stated that about all we can consider are the effects of friction. It is only recently that engineers have been able to arrive at even partial agreement on a definition of friction. We know that friction can be measured in two ways, i.e., as static friction or the drag imposed by the starting in motion of one sliding member over another, and as the constant drag on two opposed sliding members in motion. There is evidence to indicate that in the latter case, with brushes, the friction changes as the current density changes. So it follows that the current level must have something to do with brush friction. Brush friction is usually greatest at zero current level. The ability to maintain a steady condition of lowest brush friction, under the varying current conditions which may be imposed on the brushes of a machine, is one of the factors which sorts the men from the boys so far as brush grades are concerned.

Assuming that we are not considering the harmful effect of contaminants on friction, high brush friction usually results in any or all of the following undesirable brush performance characteristics.

Failure of the brush to lay down a satisfactory film on the commutator, thus indirectly causes commutator wear.

Chattering or excessive self-induced vibration of the brushes, can rise to the point where the brushes will destroy themselves by breakage. If the degree of chatter is moderate, the brushes may not break but bar burning may occur. The condition may also manifest itself by excessive frequency of flashovers. These can be propagated by the ring-fire which occurs when brushes carrying heavy current loads bounce from the commutator.

Film stripping can result from excessive brush friction. It is usually recognized as raw unfilmed streaks about the commutator periphery. Stripping can also occur if the maximum commutating speed of the given brush grade has been exceeded. Today many railroads are keeping free from commutation problems by the use of brush grades which have a maximum commutating speed level sufficient to handle any rotational speed to which the traction motors or generators may be subjected.

The lowest friction level obtainable is considered to be the most desirable. However, the need to balance brush life, commutation, and friction at optimum levels for a given application is responsible for the progress typified by new brush grades. The value of the "let's try this and see what happens" approach to brush development disappeared long ago. This approach is one of desperation engendered by lack of scientific facts. As brush technology progresses, we learn the ability to compensate for slightly higher brush friction in a grade by depositing a film on the commutator which prevents excessive wear or damage.

Since the problem of copper dragging on commutators will be dealt with as a separate question, mention is made here only that there is evidence which indicates that in some cases, the condition is caused by excessive brush friction.

Under certain conditions, it may be desirable to utilize the properties of a brush with higher than normal friction. An example would be in the case of units operating continuously in the presence of contaminating atmospheres. Even then the entire motor or generator is not equipped with these brushes. Usually only one negative stud of a generator is changed to the "cleaner" brushes; for motors one positive stud can be used. The cleaner brushes serve to provide a gentle scouring action which removes the corrosive film that would otherwise prevent the regular brushes from commutating the machine properly. Cleaner brushes should not be placed in the positive holders of a generator. The application of cleaner brushes should be considered a last resort measure.

BY K. R. MATZ
National Carbon Company

This is the fifth of a series of questions and answers which are appearing each month.

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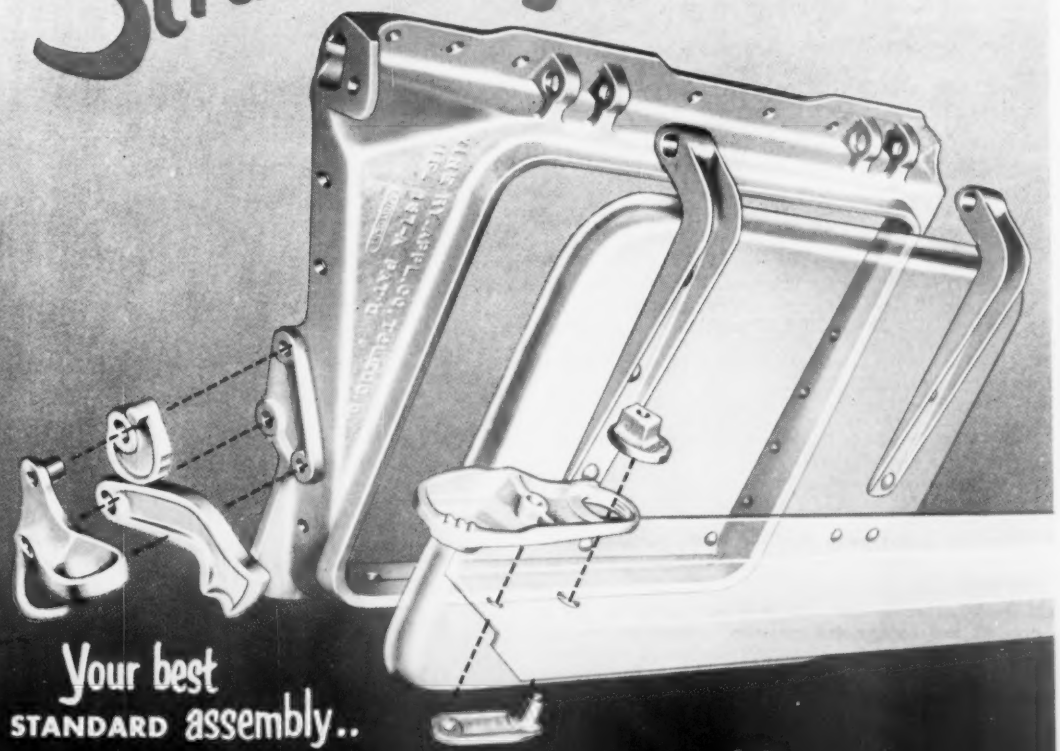

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RAILWAY LOCOMOTIVES AND CARS

QUESTIONS and ANSWERS

24-RL Brake Equipment

This is a new series of Questions and Answers pertaining to recent developments in the 24RL air brake equipment for road locomotives. The first questions will deal with the Pressure Maintaining feature. Authorized persons may obtain information on this subject in Instruction Pamphlets 2606-1, and 2601-1 Supplement 1 by communicating with their nearest Westinghouse Air Brake representative.

R89-Q—What is the connection between the maintaining cut-off valve and the first service cock assembly with the DS 24-HMC brake valve in the LAP position?
A—Passage *14a* (feed valve pressure) leads to the maintaining valve in the equalizing portion, and has a left hand connection leading into the first service cock assembly and to the chamber over check valve *887A*.

R90-Q—What pressures are separated by this check valve in the SERVICE LAP position?
A—The feed valve pressure above, and the brake pipe pressure below, via passage *14*, through the rotary valve to passage *2* to brake pipe.

R91-Q—How does this compare with the D-24 M brake valve?
A—The D-24 M brake valve does not have this check valve and there is no connection through the rotary valve to passage *14* in SERVICE LAP position.

R92-Q—What is the advantage in using Pressure Maintaining on long grade braking?
A—It minimizes the number of brake applications.

R93-Q—What benefit is there in holding a brake application throughout a grade?
A—A minimum of air is used, since it is only necessary to maintain against brake pipe leakage.

R94-Q—Why is this better than the short cycling method?
A—Because frequent recharging of the equipment is not necessary.

R95-Q—What advantages are realized insofar as air compressors and cooling and radiation systems are concerned?
A—Compressor duty is greatly decreased, so that the cooling and radiating system is not taxed. The probability of moisture finding its way to the brake pipe is greatly reduced as well.

R96-Q—How does the pressure maintaining method more evenly distribute the braking effort?
A—By permitting a light brake application that can be maintained at the desired pressure throughout the train.

R97-Q—If every car in the train brakes its intended share, is brake shoe wear uniform?
A—Yes.

R98-Q—What is one indication of uniform brake application throughout the train as a result of pressure maintaining?
A—The greatly reduced amount of smoke. This is usually heavy at the head end during short cycle braking of heavy trains.

R99-Q—How does more evenly distributed braking affect wheel temperatures and maintenance costs etc.?
A—It should result in lower wheel temperatures, reduce the need for inspecting wheels at the bottom of long grades, and reduce wheel reconditioning in the shop.

R100-Q—Where can the dynamic brake be used with the pressure maintaining method of braking to achieve the greatest advantage?
A—On varying grades and on grades having curvatures sufficient to affect the train retardation.

R101-Q—What may serve as an aid to dynamic control?
A—Where conditions and tonnage permit braking with the slack bunched, the dynamic brake may be sufficient to control the train until all cars are on the grade.

R102-Q—What can then be done?
A—A service reduction can then be made and the dynamic brake may be varied to compensate for curvature and grade changes.

R103-Q—In most cases, what is the operating problem?
A—That of definitely controlling the speed at the bottom of the grade.

R104-Q—What is required under this condition?
A—A running release at what is now considered too low a speed, with the result that a stop is frequently necessary.

R105-Q—Why are releases with the use of pressure maintaining possible at lower speeds than those previously considered safe?
A—Because pressure maintaining establishes and holds a true brake pipe gradient.

R106-Q—When would the adverse effects of a false gradient be evident?
A—It would occur following a light equalizing reservoir reduction just sufficient to establish preliminary quick service in the AB valve.

R107-Q—What might be an example?
A—Suppose a four lb equalizing reservoir reduction is made and the brake valve handle is placed in the LAP position. The quick service feature of the AB valve will reduce the brake pipe pressure about six lb.

General Motors

Diesel-Electric Locomotives

This series of Questions and Answers pertains to General Motors diesel-locomotives. The references to manual and page numbers in the text indicate where the original material may be found in the builder's technical publications or instruction manuals. These are usually available to authorized employees on each railroad.

G630-Q—What are some other items?
A—The control, fuel pump and generator field buttons must be pushed in in operating cab only. Switches must be out and locked at all other control stations.

G631-Q—Name other items.
A—The engineer's reverse lever must be in the *forward* position and transition lever in the *No. 1* position.

G632-Q—What is still another item?
A—All the brakes must be released.
Items Essential in All Units of Locomotive

G633-Q—What item must be taken care of?
A—All switches in each distribution panel must be closed.

(Continued on page 66)

The New Vista-Dome Denver Zephyr

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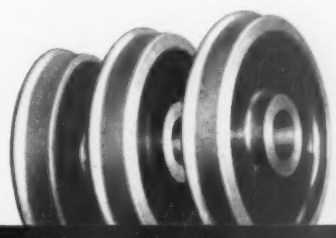

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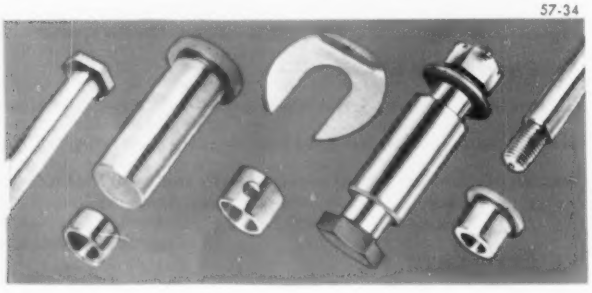

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QUESTIONS AND ANSWERS

(*Continued from page 62*)

G634-Q—What other item is essential?
A—There must be approximately 90 pounds of control air pressure on the gauge next to each distribution panel.

G635-Q—What is another essential item?
A—Fuel pumps in all units must be running and fuel flowing through sight glasses.

G636-Q—Name another essential item.
A—The engines must be running.

G637-Q—What is still another essential item?
A—The isolation switches must be in *run* position.

G638-Q—What relays must be set?
A—The ground protective relays.

G639-Q—Name another essential item.
A—The starting contactors must *not* be stuck closed.

G640-Q—What attention must be given to battery field fuses?
A—Battery field fuses in all units must be good.

G641-Q—Name still another essential item.
A—Be sure that all hand brankes are fully released.

How to Make the PCS OPEN Light Go Out.

G642-Q—What causes the PCS OPEN light to burn?
A—The PCS OPEN light is caused to burn only by an emergency or a penalty application of the brakes.

G643-Q—What is meant by a penalty application?
A—One caused by removing foot from "deadman", overspeeding, or application of train control devices.

G644-Q—What must be done to get the light to go out?
A—Make certain that the throttle is in *idle* position and then take necessary steps to fully release automatic brake.

Manual 2310 Page 506

G645-Q—What must be done, with regard to the light, if brakes are applied in service?
A—The brake valve may be placed in *lap* and left there until the light goes out.

G646-Q—What must be done if there has been an emergency application?
A—The brake valve must be lapped and then moved to *running* position before the light will go out.

Failure to Get the PCS OPEN Light To Go Out.

G647-Q—Under these circumstances, will the engines operate?
A—Engines will idle for about five minutes, but after that the engines may stop for lack of fuel.

G648-Q—Why will the engines stop?
A—When the PCS OPEN light is burning, all the fuel pumps in the locomotive are stopped.

G649-Q—If an engine stops when the light is burning, will the blue light come on and alarm bells ring?
A—No.

G650-Q—If the fuel pump is not running, what check should be made?
A—A check should be made to see if other fuel pumps on the locomotive are operating.

G651-Q—What action should be taken if all fuel pumps are stopped?
A—Items shown on Figures 5-1, 5-2 and 5-3 in this section should be checked.

G652-Q—What should be done if only the fuel pump on one unit is stopped?
A—Switch on engine control panel should be turned *on* and control and fuel pump fuses in that unit checked.

6-SL Brake Equipment

This series of Questions and Answers pertains to the 6-SL air brake equipment for switching locomotives. The references to the pamphlet, page and part numbers in the text indicates where the original material may be found in the manufacturer's technical publications and instruction pamphlets. Authorized persons may obtain a copy of Instruction Pamphlet Number 5046-15 which deals with this equipment by applying to the nearest district office of the Westinghouse Air Brake Company.

W233-Q—What do the two channels of air flow provide?
A—A fast build-up of application cylinder pressure, which quickly moves the application piston to the right, opening the application valve fully.

W234-Q—What further flow of air then takes place?
A—Main reservoir air flows to the brake cylinders, building up pressure there at the same rate the application cylinder pressure is increased.

W235-Q—How long does this flow continue?
A—Until pressure in brake cylinders exceeds that in application cylinder, when application piston moves to its final stage.

W236-Q—What insures proper operation of the self lapping portion of the brake valve?
A—When the independent brake valve handle is moved out of *Running* position into application position, exhaust valve pawl *94* on shaft *76* contacts the exhaust valve plunger and lifts exhaust valve *97a* from its seat. Thus, passage 19 from the self lapping exhaust valve *134* is provided with an opening to atmosphere regardless of automatic brake valve handle position.

Independent Application, Final Stage (Plate 7)

W237-Q—What happens as pressure builds up in brake valve Chamber F?
A—As pressure builds up in the chamber, it acts on the spring loaded piston *127*, which forms the exhaust valve seat, and moves piston 127 and the exhaust valve *134*, compressing spring *148*.

W238-Q—What further movement takes place?
A—The exhaust valve end of the floating lever moves with the exhaust valve and piston. As the lever pivots on the handle cam, application end of lever moves away from inlet valve, after which valve is closed by its spring.

W239-Q—What function then, does the self lapping unit perform?
A—The self lapping unit quickly and accurately builds up pressure in the distributing valve release and application cylinder pipe to the level called for by the position of the brake valve handle.

W240-Q—What action has taken place in the application portion of the distributing valve?
A—The application piston moves to the left. Application valve and pilot valve are closed by springs *75* and *76*, preventing further flow of air to the brake cylinders. Slide valve *16* laps ports *e* and *d*, preventing loss of brake cylinder air, holding brakes applied until further applications or releases are made.

Independent Release After Independent Application (Plate 1)
Pamphlet 5046-15 Page 43

W241-Q—What movement takes place as the independent brake valve handle is moved toward Running position?
A—The handle cam moves away from pusher pin *139* of the self lapping unit. Lever *138* then pivots on the closed inlet valve and spring *148* moves the exhaust valve from its seat.

EQUIPMENT . . NEW IDEAS—NEW USES

(*Continued from page 8*)

varied from less than 0.04 in. per min to as fast as testing permits without influencing the results. Loads from 1 to 1,000 grams can be applied to any and all specimens under observation. Focusing the impression under the microscope is accomplished through the unit's elevating mechanism. *American Chain & Cable Co., Dept. RLC, 230 Park ave., New York 17.*

Self-Powered Ohmmeter

An ohmmeter, which features accurate measurements of low resistance values and utilizes low circuit currents, has been announced. Called Low-Ohm-Meter, Model 362, the new tester gives readings from 0.1 to 25 ohms with an accuracy of 3 per cent of the full scale value. This accuracy is attained by using the expanded scale of the suppressed-infinity shunt type ohmmeter. Another feature is its circuit current of only 5 ma maximum, which prevents damage to low-current components and promotes long battery life.

The meter is suitable for checking wiring connections, contacts, transformers, and other low-resistance components as well as in servicing electric motors and generators. It uses one, self-contained battery, type C, 1½ v, for its power source. Ranges are 0.5 ohms and 0.25 ohms. The overall size is 3 in. x 5⅞ in. x 2½ in. *Simpson Electric Company, Dept. RLC, 5200 West Kinzie st., Chicago 44.*

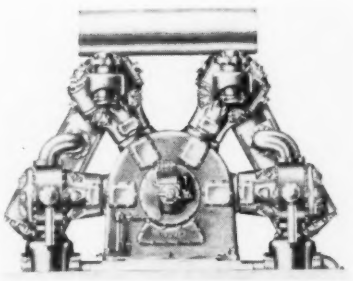
Portable Paint Sprayer

The Twin Tuffy, designed to produce high air delivery for its rated horsepower, has a ½-hp electric motor with double shaft which runs two ¼-hp diaphragm-type compressors. With delivery of 4.6 to 5 cu ft of air per min, the unit is fitted for medium production runs.

The double unit weighs 59 lb and has double handles for ease in carrying. Available as an accessory to make it more portable are wheels, an axle and handle. Base of the device acts as the base for the cart, and the wheels, axle and handle are easily assembled. Features of the sprayer include easy serviceability, large air chambers in the dome of the compressor to eliminate pulsation and assure a smooth spray, pressure valve regulator for adjustment of air, a large filter area to strain inlet air, no exposed pulleys or belts. *DeVilbiss Company, Dept. RLC, Toledo, Ohio.*

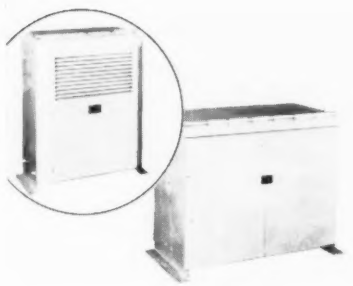
Heavy-duty Compressor

A heavy-duty industrial air compressor (350 to 1,000 hp), labelled the WN-224, is reportedly the largest package-type unit available. Its 80-125 psig output is rated from 2,418 to 6,046 cfm, depending on the horsepower. It is a four-cylinder, double-acting, water-cooled machine of semi-radial design, achieving final pressure in two stages.



There are three single and three twin unit models in addition to relative altitude sizes. Twin units are two single compressors powered by one motor. Drive may be electric, diesel engine, steam turbine, or turbo-electric combinations.

Compressor measures 9 ft 8 in. high by 12 ft 8 in. wide, type of drive and model varying the length from 8 ft 7 in. to 21 ft 11 in. Single units weigh from 26,500 to 29,400 lb. Twin units, less motor and couplings, weigh from 54,800 to 67,800 lb. *Joy Manufacturing Company, Dept. RLC, Oliver bldg., Pittsburgh 22.*



Dry-Type Distribution Transformer

A dry-type three-phase distribution transformer of new design (type DT-3) is now available. It features reduced weight and size, is quieter, and has improved appearance.

The unit uses inorganic insulation, basically silicone, and is designed for 150 deg C temperature rise. The overall volume is 25 to 51 per cent less than that of previous Class B, 80-deg C design. Weight reductions range from 17 to 32 per cent.

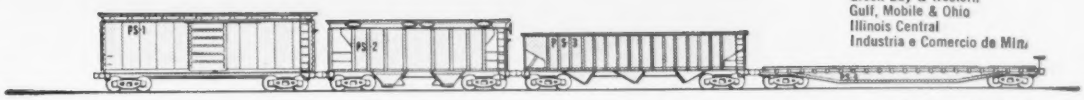
Mechanically-isolated core and coils reduce transmission of noise, permitting

(*Continued on page 70*)

PS-1
PS-2
PS-3
PS-4

Relied on by:

Akron, Canton & Youngstown
Alabama Power Co.
Amer. Smelt. & Ref. (Mexico)
American Sugar Refining
Ann Arbor Railroad
Atchison, Topeka & Santa Fe
Atlanta & West Point
Baltimore & Ohio
Bangor & Aroostook
Bessemer & Lake Erie
Birmingham Southern
Boston & Maine
Maine Central
Buffalo Creek R.R.
Canadian National
Canadian Pacific
Central Soya
Central of Georgia
Central R. R. of New Jersey
Chesapeake & Ohio
Chicago, Burlington & Quincy
Chicago & Eastern Illinois
Chicago & Illinois Midland
Chicago & North Western
Chicago Great Western
Chgo., Milw., St. Paul & Pac.
Chgo., Rock Island & Pacific
Chgo., St. Paul, Minn'pls & Omaha
City of Chicago
Clinchfield
Colo. Mill & Elevator Co.
Columbus & Greenville
Copper Range
Delaware & Hudson
Delaware, Lackawanna & West'n
Denver & Rio Grande Western
Detroit, Toledo & Ironton
Duluth, Messabi & Iron Range
Duluth, So. Shore & Atlantic
Elgin, Joliet & Eastern
Erie
Escanaba & Lake Superior
Ferrocarril Del Pacifico
Florida East Coast
Ft. Dodge, Des Moines & South'n
General American Trans.
Georgia Railroad
Western Railway of Alabama
Grand Trunk Western
Great Northern
Green Bay & Western
Gulf, Mobile & Ohio
Illinois Central
Industria e Comercio de Min.



PS-1 box car, **PS-2** covered hopper, **PS-3** open hopper, **PS-4** flat car

standardized freight cars

from the experience of the world's largest carbuilder

In 1946, Pullman-Standard, as the leading carbuilder, recommended that the railroad industry break with freight car building tradition and substitute standardization and mass-production for costly customization and hand work.

Pullman-Standard believed that the railroads would welcome freight cars designed for longer, more dependable life, reduced operating and maintenance costs. And dollar saving cars that were mass-produced with the precision and economies of modern long-run production techniques.

This belief proved correct. The first standardized freight car—the PS-1 Box Car—earned railroad acceptance and over 87,000 PS-1s have since been built or are on order. This means that one out of every four box cars built in the last eleven years has been a PS-1.

To fill other railroad rolling stock needs, Pullman-Standard has added the PS-2 Covered Hopper, PS-3 Open Top Hopper and the new PS-4 Flat Cars to its standardized freight car line.

The PS-4 Flat Car is an all-purpose unit designed in varying lengths to fit buyers' requirements. It can be used for general service, equipped with bulkheads for such lading as lumber or with hold-down devices for trailers-on-flat-car movement.

Contact with the nearest Pullman-Standard office will bring prompt response and full information on the complete line of P-S Standardized Freight Cars.

J. C. Corrigan Co.
Kansas City Southern
Lake Superior & Ishpeming
Lancaster & Chester
Lehigh Valley
Lehigh & New England
La Salle & Bureau County
Louisville & Nashville
Maine Central
Minn'pls, Northfield & South'n
Minneapolis & St. Louis
Mississippi Central
Missouri-Kansas-Texas
Monon
National Sugar Refining
Nashville, Charleston & St. Louis
New Haven
New York Central
N. Y., Susquehanna & Western
Nickel Plate
Norfolk & Western
North American Car Co.
Northern Pacific
Oliver Mining Co.
Pennsylvania
Phila. Qtz. of Cal.
Pittsburgh & West Virginia
Richmond, Fred'bg & Potomac
Rutland Ry. Co.
Santos a Jundiai
St. Louis-San Francisco
St. Louis Southwestern
Savannah & Atlanta
Seaboard Air Line
Southern Pacific
Southern Railway
Tennessee Central
Texas-Mexican
Toledo, Peoria & Western
Union Pacific
Union Railroad
U. S. Army
U. S. Navy
U. S. Trans. Corps
U. S. War Department
Virginian
Wabash
Western Maryland
Western Pacific

WORLD'S LARGEST MANUFACTURER OF FREIGHT AND PASSENGER CARS

PULLMAN-STANDARD

CAR MANUFACTURING COMPANY

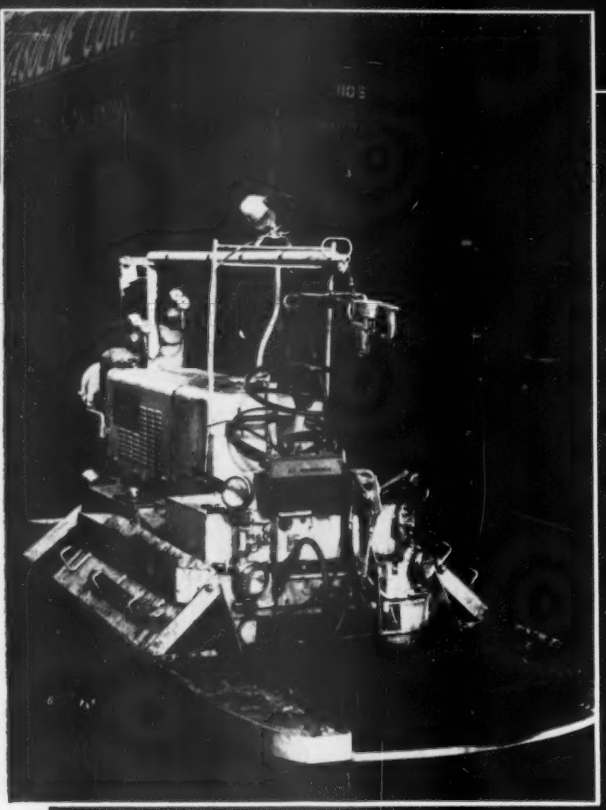
SUBSIDIARY OF PULLMAN INCORPORATED

221 NORTH LA SALLE STREET, CHICAGO 1, ILLINOIS

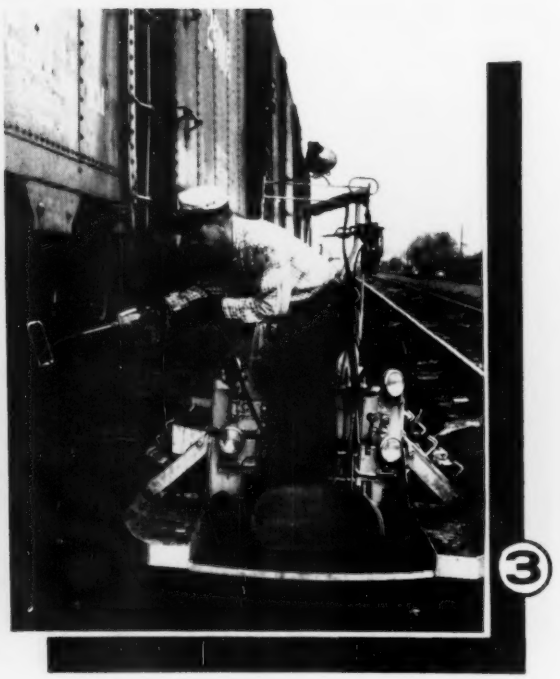
BIRMINGHAM, PITTSBURGH, NEW YORK, SAN FRANCISCO, WASHINGTON

NOW..

With the NEW Kershaw Inspector's Cart..



1. New Kershaw Inspector's Cart
2. Packing a Journal
3. Oiling a Journal
4. Working Three Tracks
5. Inspecting Cars



...Kershaw Leadership Enters the MECHANICAL FIELD!

The Kershaw Inspector's Cart enables car inspectors to carry a sufficient supply of car oil and packing to allow complete servicing of every journal box. In this way, he can completely service a much greater number of cars.

With the Kershaw Inspector's Cart, the inspector can carry a journal jack, basic hand tools, and a supply of brass, brake shoes and brake hose. This eliminates lost time in going back to the storehouse for parts. It also lessens the temptation of passing up necessary maintenance, and the necessity of routing cars to the rip track for minor repairs.

The Kershaw Inspector's Cart may be equipped with racks to hold oxygen and acetylene tanks, and a torch for repairing grab irons, steps and safety defects. It may be equipped with as many as five floodlights to completely illuminate work area for night operation.

The Kershaw Inspector's Cart will travel between box cars in yard areas. Side runners guide the cart between tie ends so the operator can devote full attention to inspection and maintenance. The Kershaw Inspector's Cart travels in either direction with equal ease at speeds up to 12 mph.

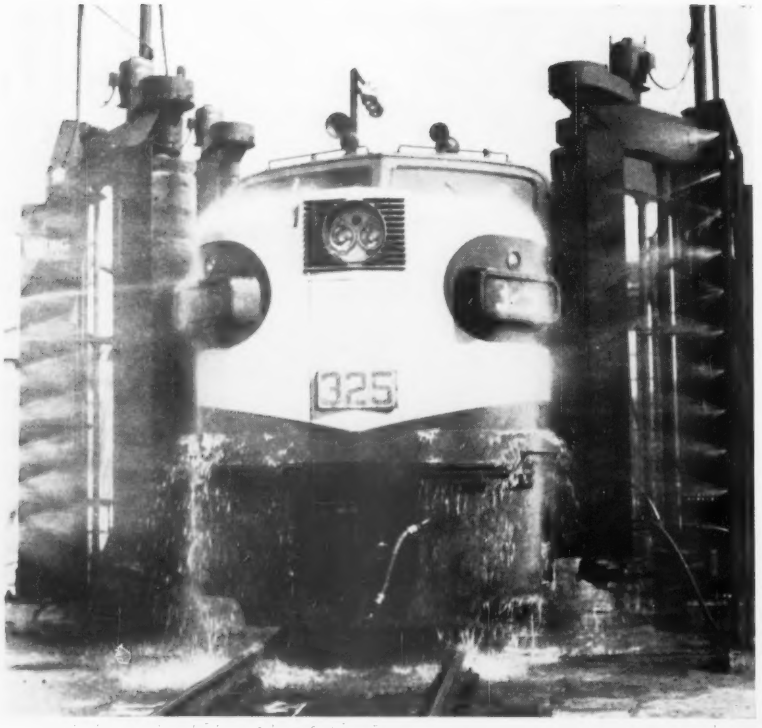
5

4

Now...
more than ever...
Recognize This Symbol of Leadership...

KERSHAW
MANUFACTURING CO. INC

MONTGOMERY ALABAMA



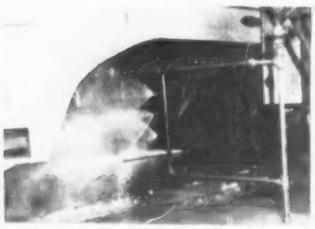
COMPLETE PACKAGE FOR EXTERIOR COACH AND TRUCK CLEANING

Here, in a double-barreled package is the answer to effective, yet economical cleaning of coach, car and locomotive exteriors PLUS trucks, wheels and underparts . . . both ideally suited for automatic, high-speed cleaning equipment.

FOR EXTERIORS— MAGNUS #85

This mild acidic type cleanser may be applied by automatic spray as shown above (or by brushes) to both sides and windows of cars. It cleans effectively and rinses freely, leaving a "like-new" look.

FOR TRUCKS, WHEELS & UNDERPARTS— SOLVITE TRUCK CLEANER



This heavy duty Magnus cleaner has been specifically designed for rapid cleaning of all underparts of diesel locomotives or cars. Moreover, regular cleaning with Solvite Truck Cleaner eliminates the need for laborious brushing or scrubbing. Merely spray on—rinse off.

Don't sidetrack your cleaning dollars by using out-dated materials and methods. Switch to this modern maintenance system today by writing for free information on this complete package method to MAGNUS, 77 South Avenue, Garwood, New Jersey. Or, contact your local Magnus Man; he'll be happy to work out a package to suit your needs.

magnus

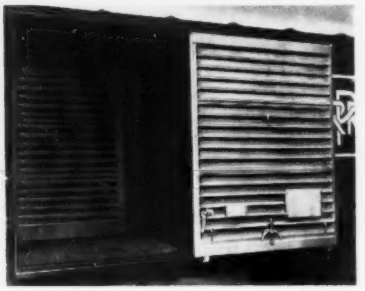
RAILROAD DIVISION
MAGNUS CHEMICAL CO., INC.
—a world-wide organization specializing in cleaning and protection of all surfaces.

EQUIPMENT

(Continued from page 65)

connection of rigid conduit to the case without causing noise transmission throughout the conduit and mounting equipment.

All terminal boards and connections are in a compartment located in the bottom of the transformer where low-temperature conductors can be used since the air in this area is at ambient temperature. Three-phase units in either 600- or 2,400-volt class are available in ratings from 45 through 300 kva. The new DT-3 dry-type three-phase distribution transformer is shown in the circle. The other unit of previous design has the same rating. *Westinghouse Electric Corporation, Dept. RLC, P.O. Box 2099, Pittsburgh 30, Pa.*



Aluminum Box-Car Door

Welded aluminum box-car doors are going into service on the Pennsylvania. Fifty 8-ft aluminum doors are being installed on Class X46 and X52 box cars equipped with loading devices.

The weight of the 8-ft aluminum side door is 256 lb compared with 523 lb for a conventional door. An additional factor is the resistance of aluminum to ordinary corrosion. The doors are not to be painted.

Aluminum for this application is 5086, a strong, weldable alloy containing magnesium and manganese. Welded construction was chosen over riveted assembly because of the greater speed, reduced weight, lower cost, and more "unitized" product. A specially designed aluminum extrusion is used in the vertical edges, or "stiles," of these doors. These extruded members provide structural rigidity for the entire door assembly as well as edge sealing.

The door's upper edge is 1/8-in. shaped aluminum sheet, and the bottom edge is standard bottom door-section from 3/32-in. sheet. The door faces are corrugated panels of three .109-in. gage aluminum sheets.

On forty of the doors standard cast-iron door rollers with lubricated anti-friction bearings were used, while the remaining ten doors, for test purposes, were fitted with Nylon rollers which do not require lubrication or anti-friction bearings.

(Continued on page 72)

there's the QUALITY side . . .

The heavier flange and improved brackets designed into the chilled car wheel approved by the AAR in 1950 make it an outstanding performer under 40- and 50-ton freight cars.

This wheel is high in safety performance as measured by ICC records throughout the country for all types of freight car service.

look at both sides of the Chilled Car Wheel

. . . and there's the side that spells ECONOMY

The Association chilled car wheel is low in first cost, high in exchange value, reducing the dollar investment required for freight car wheels.

This investment is further reduced by the accessibility of standard Association wheels from 28 plants across the United States and Canada, because this means you can operate with a smaller inventory.

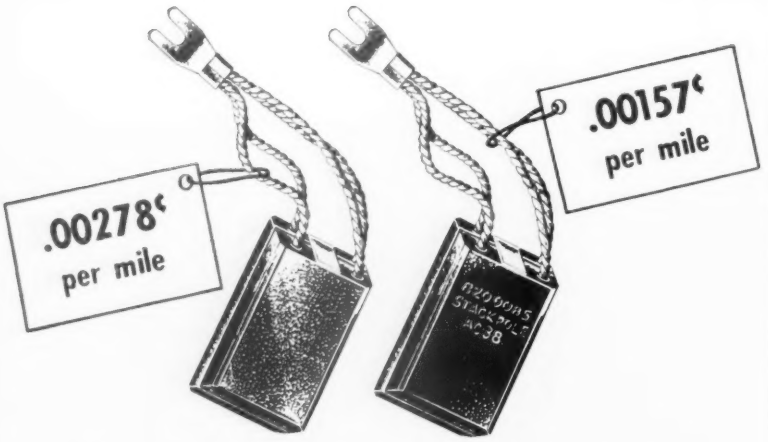
Where the service suggests a second look for the sake of good performance at reduced investment, the chilled car wheel warrants first choice.

in good supply
available locally
short-haul delivery
reduced inventory
low first cost
low exchange cost
increased ton mileage
high safety standards
plant inspection
easier shop handling

RAILWAY WHEEL ASSOCIATION

(Formerly Association of Manufacturers of Chilled Car Wheels)

445 North Sacramento Boulevard, Chicago 12, Ill. • Albany Car Wheel Co. ACF Industries • Griffin Wheel Co. • Marshall Car Wheel & Foundry Co. Pullman-Standard Car Mfg. Co. • Railroad Products Div., American Brake Shoe Co. • Canada Iron Foundries, Ltd. • Canadian Car & Foundry Co., Ltd.



What if brush prices included commutator reconditioning costs?

Long diesel-electric brush life is highly important. By no means, however, is it the only factor by which brush efficiency should be judged.

Let's assume that brush type A has an average life of, say, 50,000 miles. Brush type B lasts 100,000 miles. Therefore brush A requires six changes in the usual diesel reconditioning span of 300,000 miles. Meanwhile, brush B is only changed three times.

But Type A is kind to commutators! Things run smoothly the full 300,000 miles. Type B, while lasting longer, bar burns the commutator to the extent that an extra reconditioning is required before the 300,000 mile mark is reached.

Brushes cost about $12 per set versus approximately $400.00 for commutator reconditioning. Thus the result is easy to figure: *The true cost of type A brushes has been about .00157¢ per mile as compared to the 77% higher cost of .00278¢ per mile for brush type B.*

While only a rough example, such figures show why Stackpole engineering is based on the firm belief that smooth commutation is every whit as important as long brush life—and that the best brush for most uses is the one that strikes a happy medium between these two sometimes incompatible factors.

STACKPOLE

diesel-electric

BRUSHES

...They help keep diesels rolling... *profitably*

STACKPOLE CARBON COMPANY, St. Marys, Pa.

EQUIPMENT

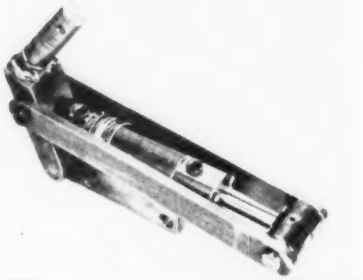
(Continued from page 70)

Possible electrolytic action between the aluminum and the ferrous parts is prevented by a coating of zinc chromate primer on the aluminum and of non-lead-bearing primer on the steel and iron. A layer of Alumilastic paste is also applied prior to joining the dissimilar metals.

The field experienced gained through daily use of these 50 doors will be supplemented by accelerated service tests of several doors in a commercial laboratory. Kaiser Aluminum & Chemical Sales, Inc., Dept. RLC, 919 North Michigan ave., Chicago 11.

Blowgun

The Safe-T-Air blowgun has been designed for the clearing of working surfaces and parts of waste cuttings, dust and particles. According to the manufacturer, 40 per cent of the air intake forms a protective screen whenever the trigger is depressed. This shields the operator from any flyback whenever the gun is used. Complete protection is afforded against flyback without use of safety goggles or masks. *E. V. Nielsen, Inc., Dept. RLC, Stamford, Conn.*



Double Acting Hand Pump

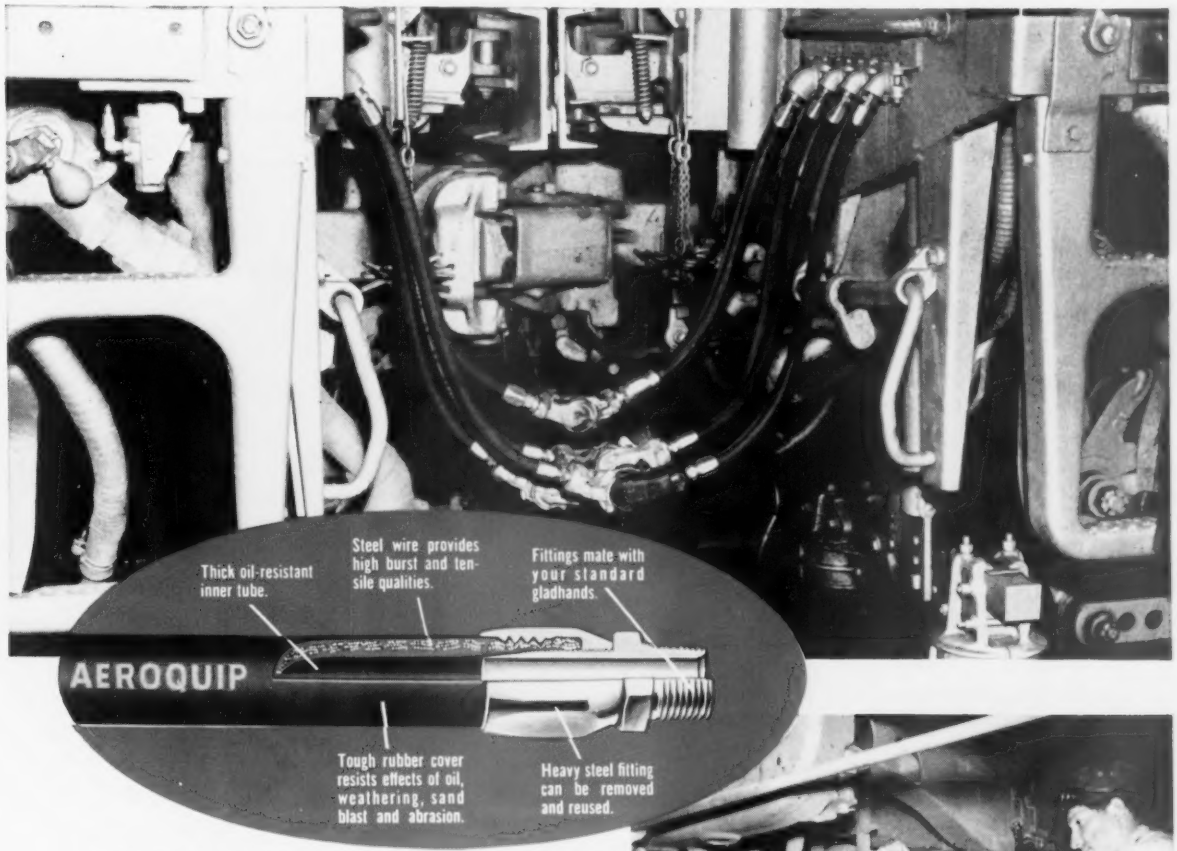
A double-acting hand pump, Model 1687, for 10,000 psi hydraulic pressure, provides more than three times the maximum capacity normally used with a constant leverage hand pump for the same pressure.

This variable leverage hand pump, designed primarily for cranes, stackers and winches, has a patented internal toggle linkage, and a capacity of .475 cu. in. per 2-stroke cycle. The handle normally used is a 28-in. length of ¾-in. pipe and can be moved through a total arc of 72 deg, but is ordinarily operated through half that distance. At 10,000 psi, the left hand portion of the stroke is used for a 3.5 to 1 advantage.

According to the manufacturer, when lifting loads at lower pressures in material handling applications, the right hand portion of the stroke would give better than three times the usual speed. *Mechanisms Company, Dept. RLC, 118 E. 2nd St., Uhrichsville, Ohio.*

(Turn to page 74)

New Aeroquip Air Brake Hose Lines Cut Replacement Costs For Santa Fe R.R.


Thick oil-resistant inner tube.
Steel wire provides high burst and tensile qualities.
Fittings mate with your standard gladhands.
AEROQUIP
Tough rubber cover resists effects of oil, weathering, sand blast and abrasion.
Heavy steel fitting can be removed and reused.

The Santa Fe is one of the first major railroads to utilize Aeroquip air brake hose lines for replacements on diesel-electric locomotives and passenger cars. It is estimated that savings will amount to many thousands of dollars a year. Here's why:

(1) Aeroquip fittings are detachable. They may be used again and again for making new hose lines.

(2) With Aeroquip, inventory may be reduced to several coils of bulk hose and a few fittings. Hose lines can be made quickly by cutting the hose to length and attaching the fittings. Only ordinary shop wrenches are needed.

Cut costs! Save time! Start using Aeroquip air brake hose lines as soon as possible. Write for complete information today.

Aeroquip

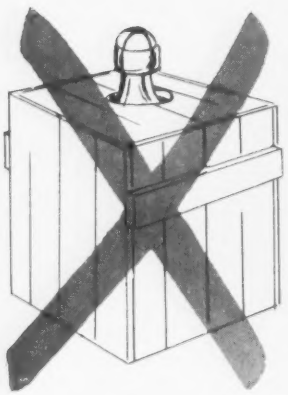
REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

IN CANADA: AEROQUIP (CANADA) LTD., TORONTO 10, ONTARIO

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

The NEW way to remove RUST • SCALE



Here's a new Oakite development that handles like a powder yet works like a liquid to remove rust and scale—it's DRYCID!

Oakite DRYCID comes in powder form. This makes it easy to handle, easy to store. Mixed with water it offers the most convenient way to clean out clogged generators, condensers and sub-cooler coils. Solutions are circulated with your regular water pump. No special pumping equipment needed.

Inhibited Oakite DRYCID removes iron sulphides, rust and other metal oxides at room temperature. Its action is 3 to 4 times faster when used at 140° to 160°F. Objectionable fumes and odors are eliminated.

DRYCID is the latest example of Oakite's endeavor to bring you low-cost end results in all your maintenance cleaning operations. For complete details write Oakite Products, Inc., 46 Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE
SCIENCE

...gives you the important advantage—low-cost end results

RAILROAD DIVISION

EQUIPMENT

(Continued from page 72)

Extra Long Drills

These longer than regular drills are available in high-speed steel with straight shank; wire gauge sizes No. 52 through No. 1 and fractional sizes $\frac{1}{16}$ through $\frac{1}{2}$ in. The taper shank size range is $\frac{1}{8}$ through $1\frac{1}{2}$ in. Lengths go to a maximum of 18 in. in the regular size range. *Chicago-Latrobe, Dept. RLC, 411 W. Ontario st., Chicago 10.*

Battery Shipping Container

The Palletainer is used for shipment of passenger car and deisel locomotive batteries between points on railroads. The container has also been furnished by railroads to battery manufacturers for shipping purposes, saving crating costs, with the railroad getting credit for furnishing the container. According to the manufacturer and pressent railroad users, previous methods using crates and cartons have been unsatisfactory, due to breakage in transit.

Constructed of low carbon steel wire, 0.306 and 0.262 gage, electrically welded throughout, the container will hold four trays of 25-plate four cell batteries, each separated from the other by a divider, welded at bottom and back panel. The front panel, hinged at the bottom, provides ease in loading and unloading. A removable front panel can be furnished.

The top cover is hinged at the center and back, and lined on the inside with ¼-in. Masonite. Two-inch by four-inch blocks fastened on the inside of front and rear panels hold the batteries in place and prevent excessive jarring.

The Palletainer is handled with a fork lift truck, and is easily stacked for handling and shipment. It can be furnished in various sizes, the 34 in. by 54 in. by 22 in. being the most popular. Its approximate weight is 245 lb. *Union Steel Products Company, Dept. RLC, Albion, Mich.*

Baldwin wheel press assembles wheel sets in as little as 2 minutes

Baldwin and Niles railroad tools are cutting shop costs drastically in the nation's leading railroads. The wheel press pictured above, recently installed in Seaboard Air Line's new shop at Hamlet, N.C., can assemble wheel sets in as little as 2 minutes. Axles and wheels are supplied by gravity racks to the press, which can be fed by one man. One assembly man and a press operator are all the manpower required to process the sets.

The Baldwin wheel press also eliminates substantial installation costs. Due to the fact that the carriage has its own built-in elevator, the machine can be accommodated by a pit only 6 in. below the floor line— in contrast with pits 6 or more ft. deep required for conventional equipment. Other efficient B-L-H railroad machine tools in operation at Seaboard's Hamlet shop include a new Niles wheel borer with sidehead, a Niles wheel lathe, and a specially designed Niles axle turning and burnishing lathe.

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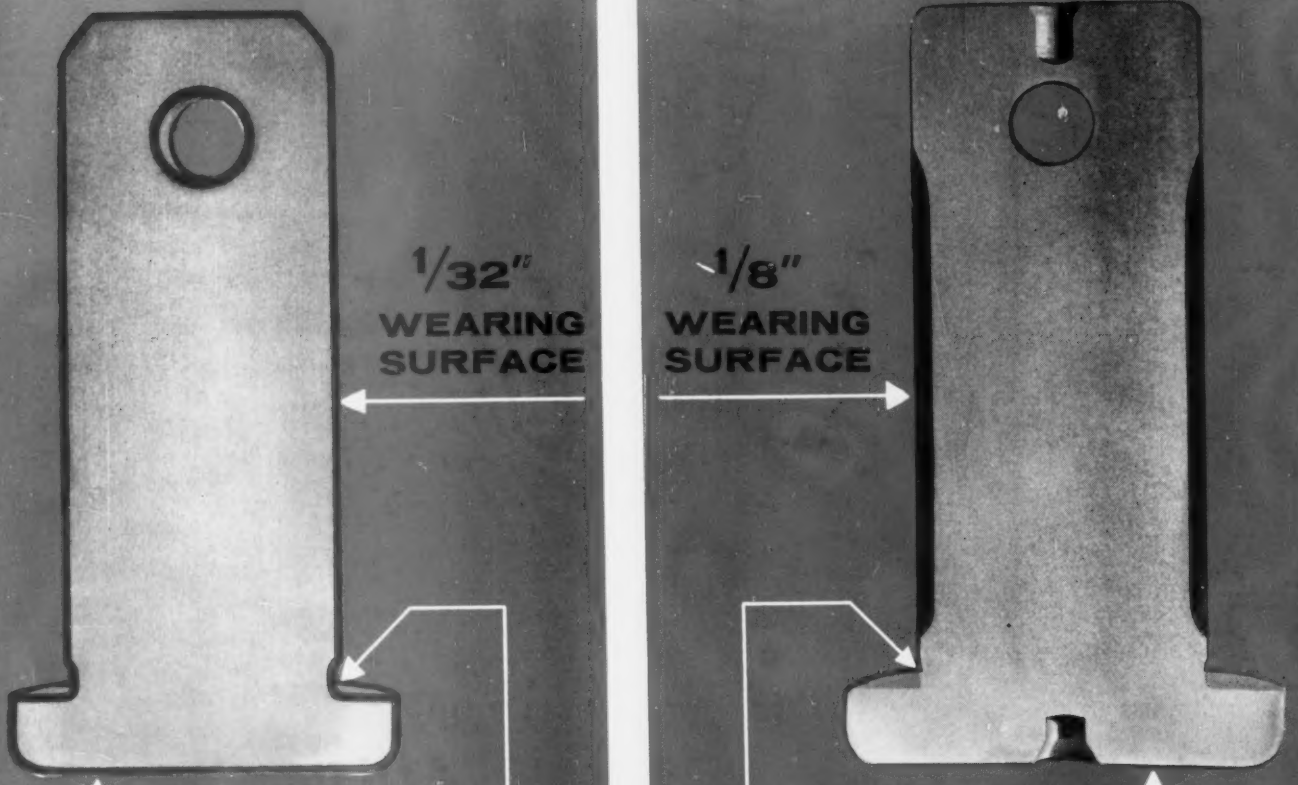
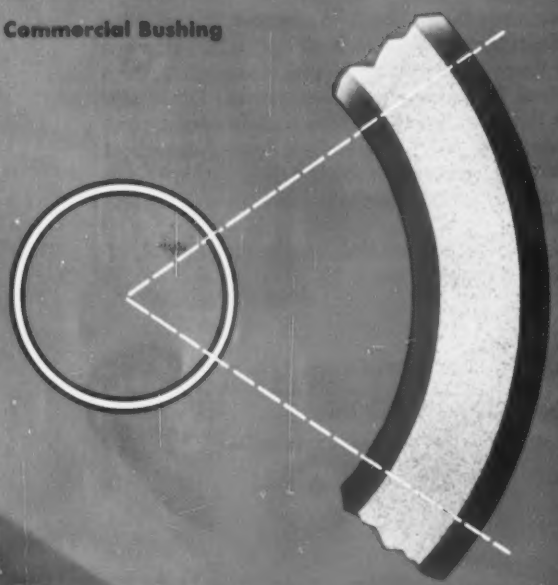


Commercial Bushing



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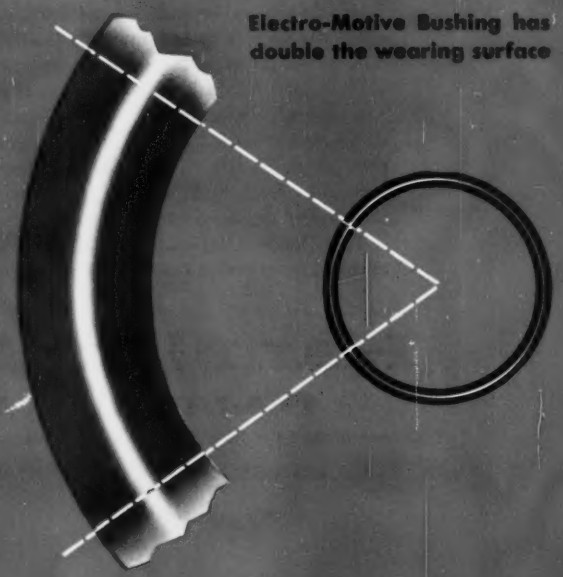

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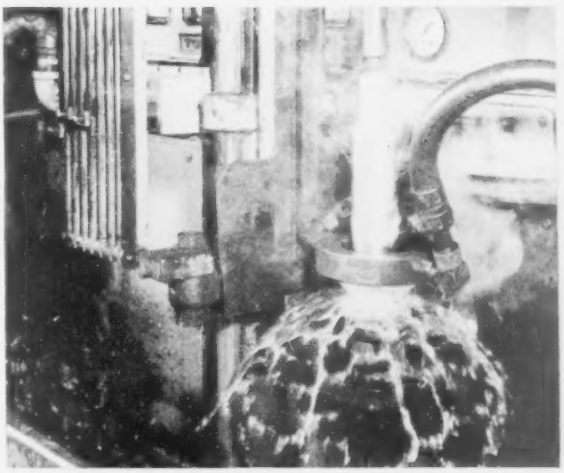

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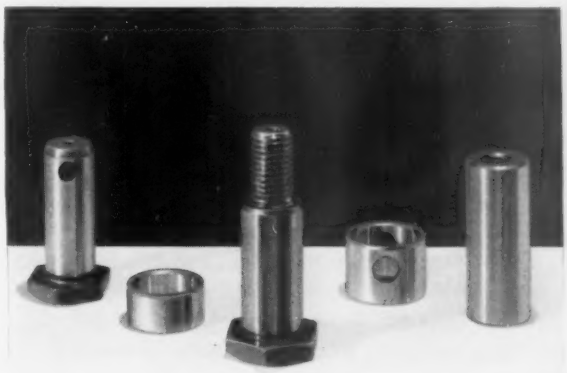

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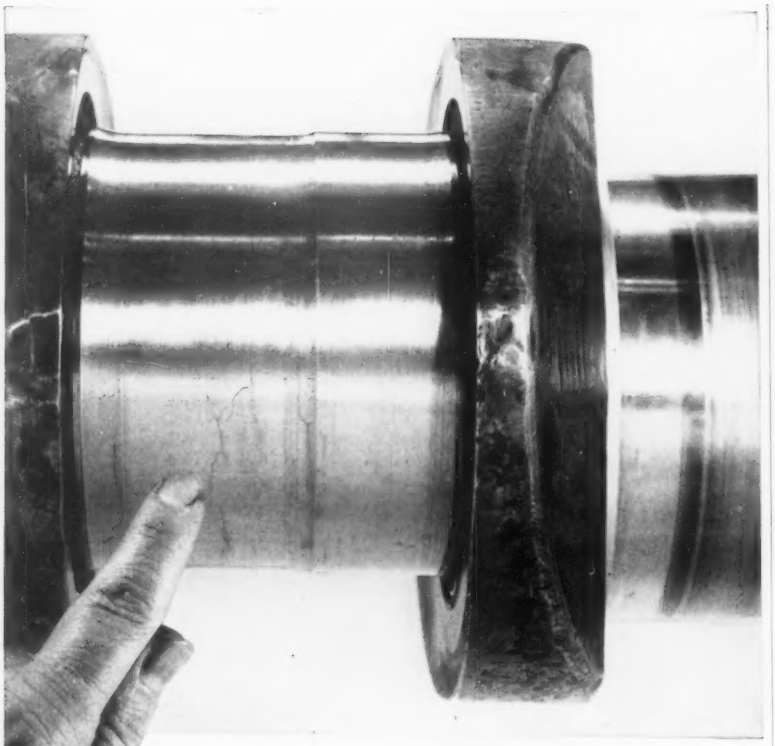

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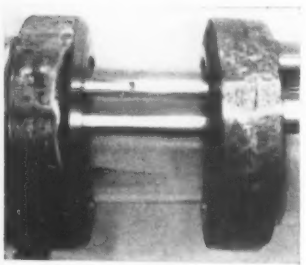
For more details on crankshaft repair write for Bulletin 2C-1



This is a finished, repaired crankshaft, after processing by National Forge.

NATIONAL FORGE AND ORDNANCE COMPANY

Irvine (Warren County), Pa.

8500-Hp Locomotive Power Plants

(*Continued from page 56*)

path. The air from the fourth-stage compressor extraction cools the cylindrical portion of the turbine shell, the exhaust struts and the aft side of the second-stage wheel.

Shaft-driven accessories mounted on the main reduction gear include the fuel regulator, atomizing air compressor, fuel pump, hydraulic control pump for the flow divider, tachometer and lube pump. The motor-driven accessories include a vapor extractor and a d-c auxiliary lube pump. The lube oil tank is mounted below the gear, and all of the lube oil is in this gear area except for the number two bearing.

The fuel regulator produces mechanical output signal to the fuel system. It is an electrohydraulic-mechanical device receiving a speed signal from internally contained fly-balls, pneumatic exhaust temperature signals, electric speed-setting signals, and electric starting signals. An electric signal for generator load limit is also produced.

The exhaust temperature signal is obtained from a thermostatic device that throttles compressed air as a function of temperature to produce a signal for the fuel regulator. A gear-pump system is used for metering fuel. The atomizing air compressor is of the rotary type, operating at 5,300 rpm. Several static accessories are mounted on the gear casing and lube tank cover. They include lube oil cooler, atomizing air cooler, fuel heater, lube oil filter and fuel stop valve.

Conclusion

A locomotive of this size must be able to operate consistently as a single unit; therefore, the reliability of each critical device is extremely important. In some cases, multiple-unit operation of device is desirable. For instance, two air compressors have been installed, either one of which is large enough to handle a normal size train. In general, however, reliability must be gained by reducing the number of components to an absolute minimum and making them of the highest possible quality. In addition, minimizing the number of devices will contribute toward

(*Continued on page 82*)

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wherever environment is a problem

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HELPS FROM MANUFACTURERS

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information, write direct to the manufacturer.

"BREAKING LUBRICATION BARRIERS". A 16-page bulletin No. 110, printed in four colors, provides a textbook on technical aspects of molybdenum disulfide as an extreme pressure lubricant. Physical and chemical properties are also covered, together with a catalog-type selection table, photographs showing variety of uses, and a section on solid film lubricating coatings. (Write: *Alpha Molykote Corporation*, Dept. RLC, 65 Harvard ave., Stamford, Conn.)

WELDWOOD ARMORPLY. Folder describes Weldwood Armorply, a panel usually with a plywood core and metal facings, for truck and trailer floors and doors, walk-in coolers and freezers, railroad car interiors, building fronts, etc. Describes also a series of simple beam bending and plate bending tests, and twisting shear and edgewise compression loads tests. (Write: *United States Plywood Corporation*, Dept. RLC, 55 West 44th St., New York 36.)

RYKON GREASES.—4-page bulletin No. 127 outlines eight advantages of a new multi-purpose industrial grease having a non-soap hydrocarbon thickener. Typical test data includes service applications and photographs of grease structure. (Write: *Standard Oil Company (Indiana)*, Dept. RLC, Chicago 80).

BRASS VALVES. Four-page folder gives complete sizes and dimensions of brass composition-disc globe, angle, and lift check valves for steam, water, air, oil, gas, and gasoline lines. (Write: *Crane Company*, Dept. RLC, 836 S. Michigan ave., Chicago 5.)

"CARE OF DRILLS AND REAMERS." 22-page booklet gives technical data on use, sharpening and handling of drills and reamers of either high-speed or carbide steel. Illustrated with graphs and charts. (Write: *Chicago-Latrobe*, 411 West Ontario st., Chicago 10.)

LEADED ALLOY STEEL. 8-page engineering data bulletin No. 14-5, describes the advantages of Rycut 40, a chrome-moly .40 carbon steel alloy with controlled addition of lead. Case studies and mechanical properties also included. (Write: *Joseph T. Ryerson & Sons, Inc.*, Dept. RLC, Box 8000-A, Chicago 80.)

HELIWELD EQUIPMENT.—Catalog 2,300 illustrates complete line of equipment designed for use in applications of Air Reduction's tungsten arc Heliweld process. Discusses advantages of process and factors which determine equipment selection. Contains information on various types of manual, semiautomatic, and automatic equipment; on accessory devices, and on the selection of the electrode and filler wire most suitable for use in any specific Heliwelding operation. (Write: *Air Reduction Sales Company, a division of Air Reduction Company*, Dept. RLC, 150 East 42nd st., New York 17.)

ASBESTOS TEXTILES. 16-page nontechnical manual contains information to guide product engineer or designer in selection of asbestos textiles for any use. Products covered include cloth, tape, tubing, lap, roving, cord, wick, and rope. (Write: *Union Asbestos & Rubber Co.*, Dept. RLC, 1111 West Perry st., Bloomington, Ill.)

WELDING BLOWPIPE. Six-page folder (Form 1007) describes three Oxweld welding blowpipes which operate at acetylene pressures less than 1 lb psi. Information and performance data on welding heads and cutting nozzles also included. (Write: *Linde Company*, Dept. RLC, 30 East 42nd st., New York 17.)

SPRAY BOOTHS. Catalog I-7000 describes spray booths of every type, size and application, including custom design units and/or "ready-made" units which can be erected with only a wrench and screwdriver for tools. Selector Guide gives capsule descriptions of various booths, how they work, and their primary uses, each illustration being keyed to page and section in succeeding pages for more detailed information. Special section details points to consider in selecting a spray booth. (Write: *DeVilbiss Company*, Dept. RLC, Toledo 1, Ohio.)

LUBRICANT TESTING MACHINE.—Revised Bulletin 106 includes new operating information on the Model LFW-1 lubricant-friction-wear testing machine, a more complete description of the machine's operation, and a revised list of specifications in English and Metric systems. Shows also details of specimen holder and lubricant reservoir. (Write: *Alpha Molykote Corporation*, Dept. RLC, Stamford, Conn.)

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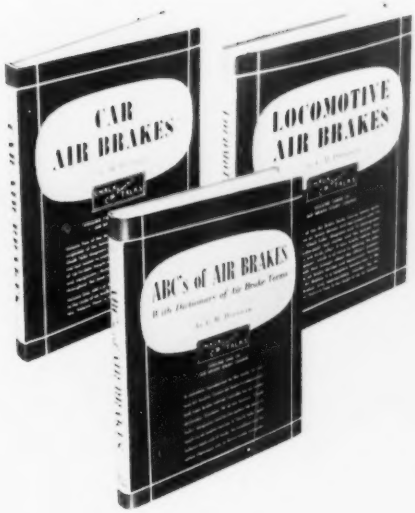

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Vol. 2 (Car Air Brakes) covers all car airbrake valves and other devices; freight car brakes—AB, ABLC and AC. Passenger car brakes—D-22-P; electro-pneumatic; speed-governor control; Decelostat equipment; universal control.

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(*Continued from page 78*)

reliability by reducing the out-of-service maintenance time. A comparison of the following figures indicates the progress made in this respect.

Any tabulation of this type can give only an approximate comparison since items having vastly different ratings and requirements are compared. It does, however, indicate the relative amount of maintenance the equipment will probably require.

The gas turbine for these locomotives represents a considerable improvement. A significant gain in thermal efficiency is expected from improved component performance and an increase of up to 50 deg F in firing temperature. The knowledge developing out of the mechanical, temperature and residual fuel problems encountered with the 4,500-hp locomotives, has naturally been applied to this new gas turbine power plant. Mechanical design and control design improvements have been made in regard to thermal stresses from heat shock and temperature differences. The reverse flow combustion system with a 25 per cent longer flow path from fuel nozzle will contribute to a better temperature traverse to the turbine nozzle. Numerous mechanical improvements have been made to increase accessibility for maintenance and to reduce air leakages.

An improved fuel regulator, a sturdier atomizing compressor and a self-contained lube system for the turbine and gear, using a shaft-driven lube pump, have been applied.

Throughout the entire locomotive design, consistent efforts have been directed toward reducing the number of components to an absolute minimum, and designing and locating them for easy maintenance. Gas turbine mechanical, control and thermal design improvements have been incorporated. Moreover, a high premium has been placed upon the reliability of each critical device under the exacting conditions of railroad service. Every effort has been made to use parts and practices already developed and proved in locomotive service. In short, these locomotives are being designed and built to meet the need for increased speed and dependability in freight transportation, and to do this at economical operating and maintenance costs.

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L&HR southbound freight, doubleheading Alco road switchers, approaching the Lackawanna crossing at Andover Junction, N. J.

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L&HR

The Lehigh & Hudson River Railway Company is a short but busy bridge line, providing—through the New Haven—a connection to New England for the Central of New Jersey, the Lackawanna, the Lehigh Valley and the Pennsylvania. Each of these roads, and also the Erie and Reading, own substantially all of L&HR stock. The main line extends 85.8 miles from Easton, Pa., to Maybrook, N. Y., and a branch runs 9.8 miles from Andover to Port Morris over Lackawanna tracks. The L&HR was completely dieselized late in 1950.

114

Lehigh & Hudson River

All train and switching movements are handled by identical power—15 Alco 1,600-hp. road switchers. Passenger trains have not operated since 1939.

	1955	1954
Freight revenue	$5,154,493	$5,217,236
Total operating revenue	5,168,592	5,228,717
Net income	252,522	417,938
Operating ratio	69.0%	68.5%
Gross ton-mi. per frt. trn.-hr.	38,161	38,963

Robert I. Husler was elected president of the L&HR in 1956. Mr. Husler was born in Demarest, N. J., in 1890 and his entire railroad career has been with the road he now administers. Prior to service as first lieutenant, A.E.F. 1917-1919, he was employed in various clerical positions, and, upon his return, advanced from chief clerk to the president and general manager to vice president, secretary and treasurer in 1953.

Misc. Statistics and Equipment Data:

A&B expenditures	$497	Locomotives (units): diesel-elec.-freight	15
Total frt equip. (incl. misc)	14,149	Total diesel-elec.	13
Total for road	3,559,288		
Rev. tons carried	250,568		108
Rev. ton-mi. carried	1.26	Freight cars:	15
Rev. per ton-mi. (cents)	36.00	gondola and hopper	125
Weight of rail in main tracks:	38.00	caboose	14
mi. 100 to 127 lb.		Total freight cars	
mi. 150 and over		Company service equipment	

115

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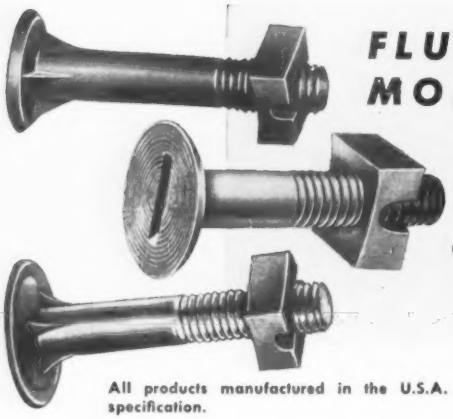

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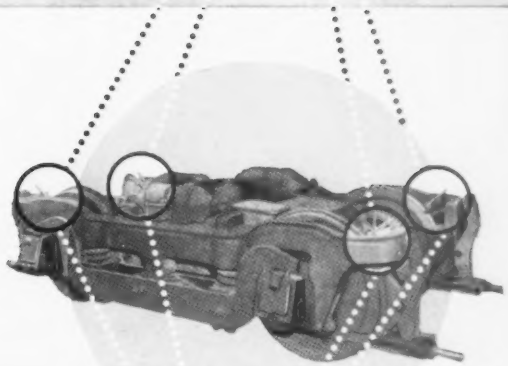
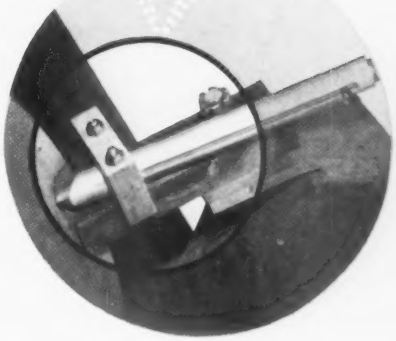


WITH *Nalco* TYPE TA **FLANGE LUBRICATOR**

USING *Nalco* **"MOLY"** STICKS



Nalco "Moly" Stick is a highly-efficient *dry* lubricant that maintains a lubricating surface between locomotive wheel flanges and track under extremes of pressure and temperature . . . without *picking up dirt and sand to form a grinding compound.* In new Nalco Type TA Lubricators, "Moly" Sticks provide automatic flange lubrication that has extended wheel life from a substantial 30% to as much—particularly on yard locomotives—as a whopping 300%!

Cost of Nalco Type TA Lubricators and "Moly" Sticks is small. Maintenance is limited to occasional stick replacements. Complete installation of lubricators on a diesel unit can be done by your shop personnel in four hours or less.

Call or write for details on the simplicity and continuing economy of Nalco Flange Lubrication for your locomotives.

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